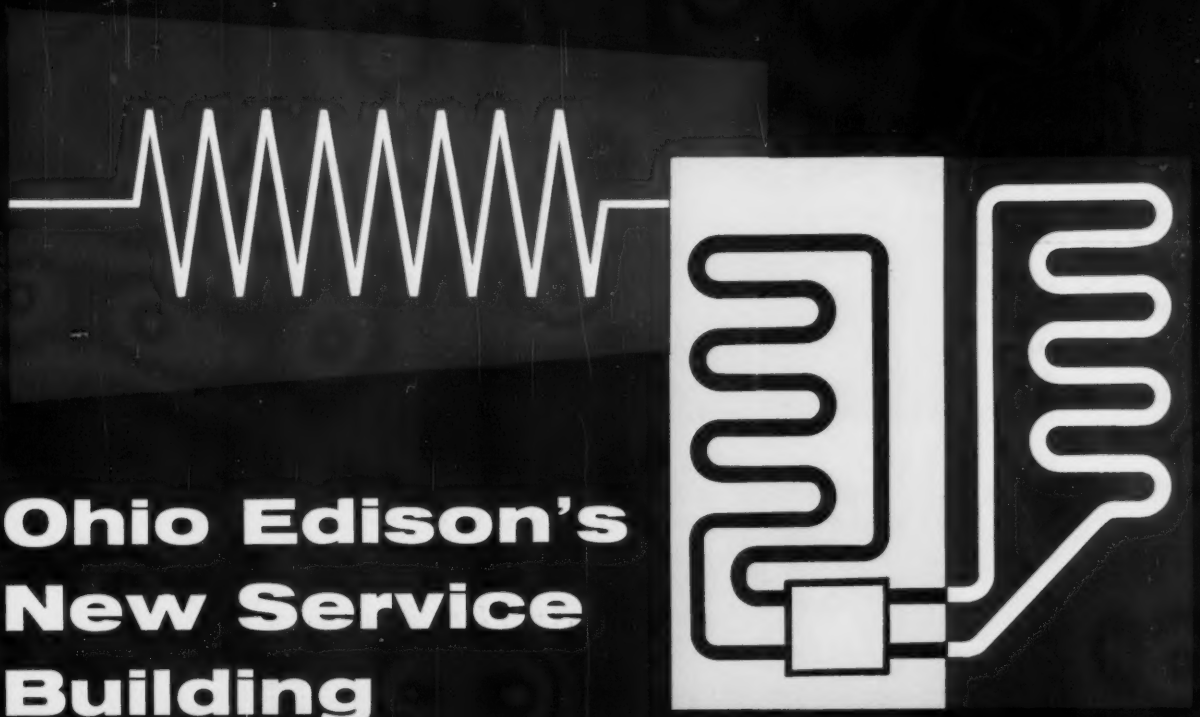
The Electrical Industry's Weekly Magazine June 15, 1959

Electrical World

Price 50 Cents

A McGraw-Hill Publication



Ohio Edison's New Service Building Heated & Cooled Electrically

page 46

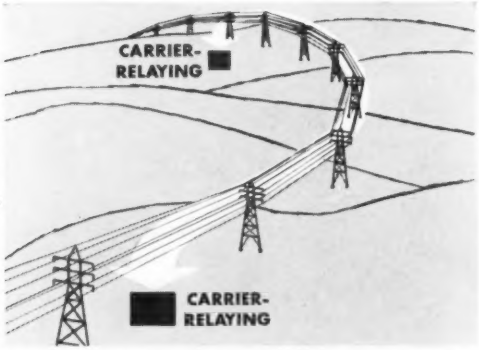
Deadline Near on Relocation Problems

. . . page 75

N.Y. Power Study: Does Signal a Policy Shift? - p 4

STEVENS RICE GS N
UNIVERSITY MICROFILMS 1
313 N 1 ST
ANN ARBOR MICH

NEW G-E STATIC RELAY and the carrier complete staged fault test on Muskingum-Philo 138-Kv line of Ohio Power Co. Checking new relay are Mr. Arthur Hauspurg, Relay Section Head, American Electric Power Service Corp.; and Mr. R. H. Macpherson, Manager—Relay Engineering for General Electric.



TRANSISTOR CARRIER CURRENT CHANNEL, together with General Electric's new Static Phase-comparison Relay, provides co-ordinated transmission line protection.

General Electric Opens a New Era in Protective Relaying

. . . with first static phase-comparison relay

The perfection of reliable static components makes possible practically maintenance-free relays . . . desired by utility men for years. In addition, improved forms of relays using static components will open new fields of application never economically possible before. Static protective relays can now be created that will provide the functions and the characteristics required by modern power systems—higher speed, less maintenance, increased sensitivity, lower burdens.

A line of static protective relays is now on the drawing board for protection of the complete electric utility system . . . transmission lines, transformers, generators and buses.

STATIC PHASE-COMPARISON RELAY is the first in the General Electric line of new static relays. It compares the phase position of currents at the line terminals to provide simultaneous, high-speed tripping of a faulted transmission line. Transistor measuring elements provide higher speed, improved stability of characteristics, and reduction in maintenance costs.

G-E TRANSISTOR CARRIER CURRENT EQUIPMENT provides the communication tie for co-ordinated line protection. Fully transistorized transmitters and receivers offer high-speed channels . . . conservation of frequency spectrum . . . and full 10-watt power output.

This joint product development helps assure electric utilities of improved system protection now . . . and economical system expansion when load growth demands it. 301-406

W. E. HUNT, MANAGER—Relay Sales, displays module construction of new static phase-comparison relay.

MORE POWER TO AMERICA

GENERAL ELECTRIC

Electrical World

Vol. 151, No. 24 JUNE 15, 1959

Published for 85 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

In This Week's Issue

p 40

CURRENT EVENTS

N. Y. State Launches Power Survey

Gov. Rockefeller names seven to power study group. Will work closely with State Power Authority.....p 40

p 46

MANAGEMENT NEWSLETTER

Deadline Near on Relocation Problems

Federal highway program raises utility relocation problems that must be jointly solved.....p 75

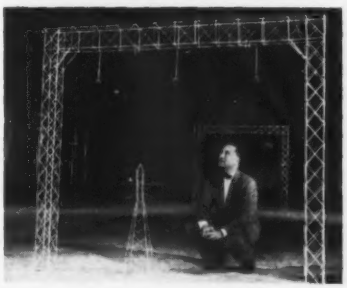
HEATING AND COOLING

Service Building Electrically Heated

L. H. Ruhlen, Commonwealth Associates, G. W. McElhaney, Ohio Edison

Plan for Ohio Edison building provides operation cost comparison with two conventionally heated buildings.....p 46

p 48



RELAYING & PROTECTION

Top Relay Settings Handle Cold Load Pickup

R. S. Smithley, Federal Pacific Electric Co

But inrush current settings demand careful calculation, especially when circuits have no motor load diversity.....p 52

TRANSMISSION

Project EHV Construction Begins

Cooperative studies will use GE Pittsfield facility; steps to 460, possibly to 650 kv, spur participants.....p 48

Departments

Editorials 39
Electric Utility Methods..... 50
• Electrical Week..... 19
Engineering Reference Sheet 59
Executive Reader 22
From the Publisher..... 5
• Management Newsletter... 75
Manufacturers News 64
New Equipment 83
News About People..... 90
Politics and Public Power... 20
• Procurement & Products... 62
Readers Forum 94
Readers Service 85
INDEX TO ADVERTISERS... 94

POWERS *American*

SERIES LM-4

"Load-Master"

HYDRAULIC CRANE

Saves time and manpower because it speeds up loading and unloading jobs... handles work normally requiring several specially-equipped vehicles.

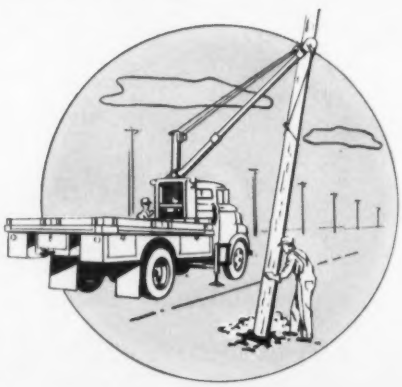
Load-Master lifts a 4000 lb. load with ease... moves it safely and quickly under the most adverse job conditions. Power is derived from a heavy-duty hydraulic pump driven by the truck engine. Controls are located in a position which gives operator full view of the crane at all times.

Operator has absolute control of load at all times. The hydraulic system requires intentional movement of control levers before load position can be changed... and the load cannot drop if the truck engine stalls.

OPERATING FEATURES: Telescopic-type hydraulic boom can be spotted at any point from horizontal position to an 85° angle of elevation; hydraulically-powered mast will turn 360° in either direction; specially-designed winch, driven by a hydraulic motor, is grooved to wind cable evenly; hydraulic outriggers, with swivel-mounted foot plates, furnish extra side stability.

Load-Master is ideally suited for use with the Powers-American Series 300 Body shown above. It can also be furnished with bodies of other types... or shipped for mounting in your shop or local garage.

Price information and descriptive literature will be sent upon request.



Load-Master can be used for setting poles up to 45' in length. It requires only 20" of mounting space behind the truck cab. Boom extensions to 22' can be furnished.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY, ST. LOUIS 15, MO. | 625 CEDAR STREET, BERKELEY 10, CALIF. | 5525 S E. 28TH AVE., PORTLAND 2, ORE.

Gas Lights Must Go!

The gas yard lights were a fad anyway. They have had their day.

We think these mantled monsters will soon be taking their proper place in the garage along side the dented hoola hoops.

It is heartening to see that a number of electric utilities are coming to grips with the fad and offering their customers modern, workable, electric yard lights. One company, for instance, is promoting two styles of decorative yard lights—both equipped with a convenience outlet for outdoor appliances such as hedge trimmers, lawn mowers, or electric rotisseries.

The outlet offers an extra attraction for the customers and a possible source of future load for the utility. One of our electric dreamers would even like to attach a bug killer to the outdoor electric light, but we'll let him tell you about that (see p 94).

The point we want to make here is that you owe it to your customers to help them out of the neo-gaslight era and back toward modern all-electric living.

Fischer Black

Electrical World Staff

Fischer Black Publisher and Editor
Charles Hochgesang Assistant to Editor

Daniel T Braymer Senior Editor

Engineering

Leonard M Olmsted Managing Technical Editor
Howard S Knowlton New England Editor, Boston
Edward Allen Midwestern Editor, Chicago
Francis J Kovalcik Middle Eastern Editor
Paul H Leech Western Editor, San Francisco
James G Plunkett Associate Editor
George Swift Associate Editor
Kenneth N McLean Northeastern and Industrial Editor
Leon A Allen, Jr Assistant Editor
Elizabeth R Parker Assistant Editor
Archer E Knowlton Consulting Editor

News

Herbert R Frankel Managing News Editor
Thomas R Jordan Assistant Managing News Editor
Theodore Fuller News Editor
Michael G Duerr Assistant News Editor
John D Damon Commercial Editor
George B Bryant, Jr Manager, Washington Bureau

Special Services

Arthur J Stegeman Manager, Market Research
Dexter M Keezer Director, Economics Department

Production

Jesse A Mock Manager of Production
Frank C Stockman Art Director
H Tomlinson Howland, Jr Associate Art Director

Advertising

Warren W Shew Sales Manager
District Managers: W R Klein, L R Lawrence, D J Roberts, New York; L R Lawrence, Boston; F P Coyle, Philadelphia; M S Kearney, E F Coffey, Jr, Cleveland; E F Coffey, Jr, Detroit; M S Kearney, Pittsburgh; W H Meneilley and J T Schaefer, Chicago; J T Schaefer, St. Louis; Russell Antles, Los Angeles; R C Alcorn and T H Carmody, San Francisco; Robert H Powell, Atlanta; F E Holland, Dallas; John Patten, Denver.
Otto A Drechsel Business Manager
John F Dugan Assistant Business Manager
Donald K Ellis Promotion Manager

E Bryson Sessions Circulation and Sales Service Manager

ABP **ELECTRICAL WORLD**

Vol. 151, No. 24, June 15, 1959

Published weekly by McGraw-Hill Publishing Co., Inc., James H. McGraw (1860-1948), Founder. **Executive, Editorial, Circulation and Advertising Offices:** McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Printed at 99-129 North Broadway, Albany 1, N. Y. See panel at right for information regarding subscriptions or change of address.

Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice-President; L. Keith Goodrich, Vice-President and Treasurer; John J. Cooke, Secretary; Nelson Bond, President, Publications Division; Shelton Fisher, Senior Vice-President; Ralph B. Smith, Vice-President and Editorial Director; Joseph H. Allen, Vice-President and Director of Advertising Sales; A. R. Venezian, Vice-President and Circulation Coordinator.

Subscriptions are solicited from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields; and from consulting engineers and electrical engineers in industry. Position and company connection must be indicated on subscription orders. Send to address shown in box at right.

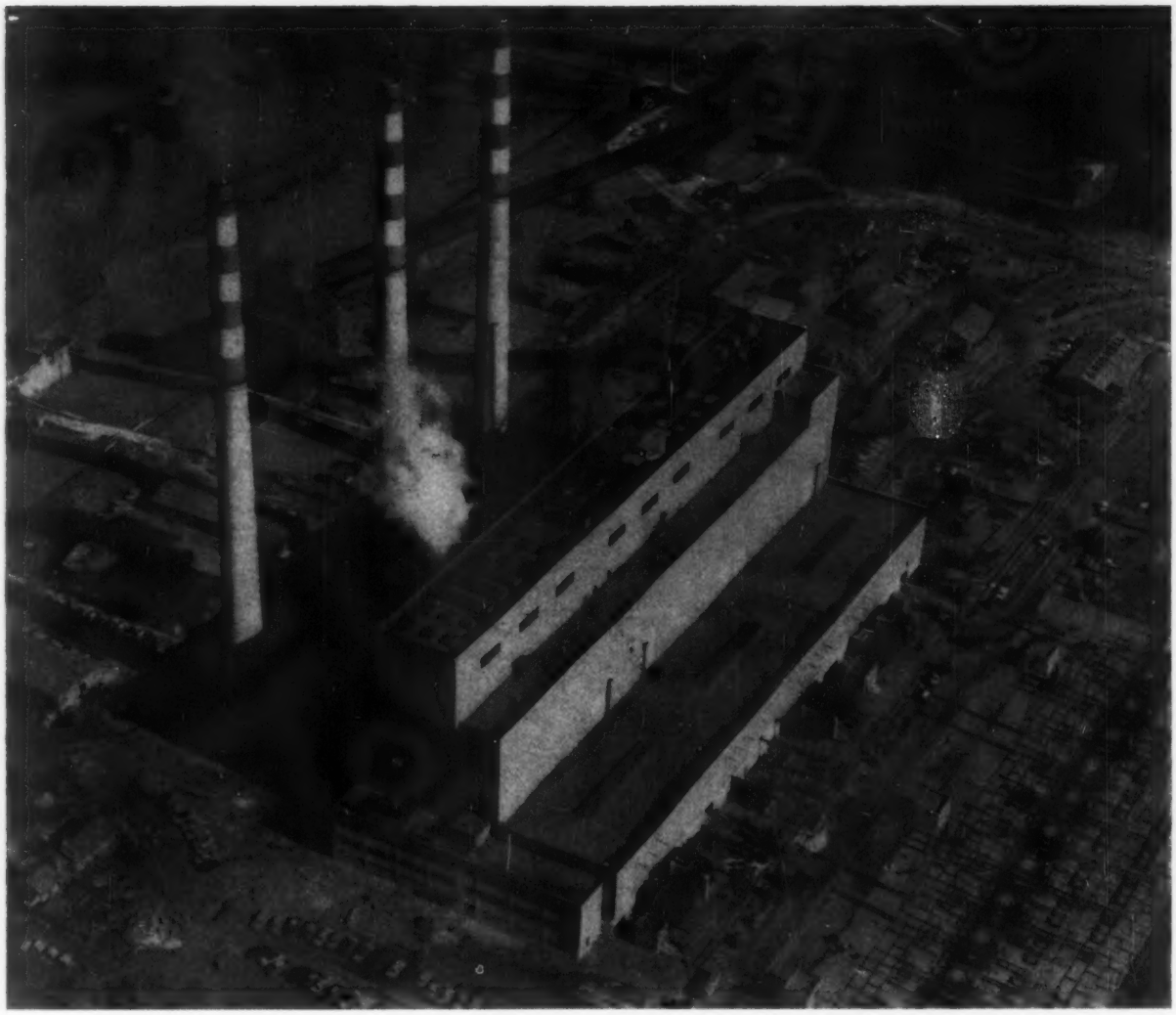
United States and Canada subscription rate for individuals in the field of the publication $6.00 per year; single copies 50 cents. Other Western Hemisphere and the Philippines $20.00 payable in advance and other countries $30.00 payable in advance.

Second-class postage paid at Albany, N. Y. Title registered in U. S. Patent Office.

©Copyright 1959 McGraw-Hill Publishing Company, Inc. All rights reserved. Permission required to reproduce any of contents. Printed in U.S.A.

SUBSCRIPTION AND ADDRESS CHANGES: Send subscription correspondence and change of address to Fulfillment Manager, ELECTRICAL WORLD, 330 West 42nd Street, New York 36, N. Y. Subscribers should notify Fulfillment Manager promptly of any change of address, giving old as well as new address, and including postal zone number, if any. If possible, enclose an address label from a recent issue of the magazine. Please allow one month for change to become effective.

Postmaster . . . Please send form 3579 to Electrical World, 330 W. 42nd St., New York 36, N. Y.



New Electric Generating Station for Memphis Equipped with Phelps Dodge Condenser Tubes!

The new Thos. H. Allen Electric Generating Station of the Memphis Light, Gas & Water Division, City of Memphis, Tenn., is designed to answer the need for increased electric power in Memphis and surrounding Shelby County. This mammoth plant, designed by Burns and Roe, Inc., and constructed under their supervision, has three hydrogen-cooled turbine generators and three multiple-pass condensers, with a new capability of 812,500 kilowatts.

Within the condensers are more than 298 miles of Phelps Dodge Admiralty condenser tubes, weighing about a million pounds. These 30-foot-long tubes help each unit condense steam from the generators at the rate of over one million pounds per hour. Each condenser has a heat transfer-rate of 980 BTU per pound of condensed steam.

Phelps Dodge condenser tubes are known for lasting quality and expert workmanship in industries using heat transfer equipment. This reputation has made Phelps Dodge a leading manufacturer of copper and copper-alloy tubes for the fabricators of condensers and heat exchangers.

PHELPS DODGE COPPER PRODUCTS

CORPORATION

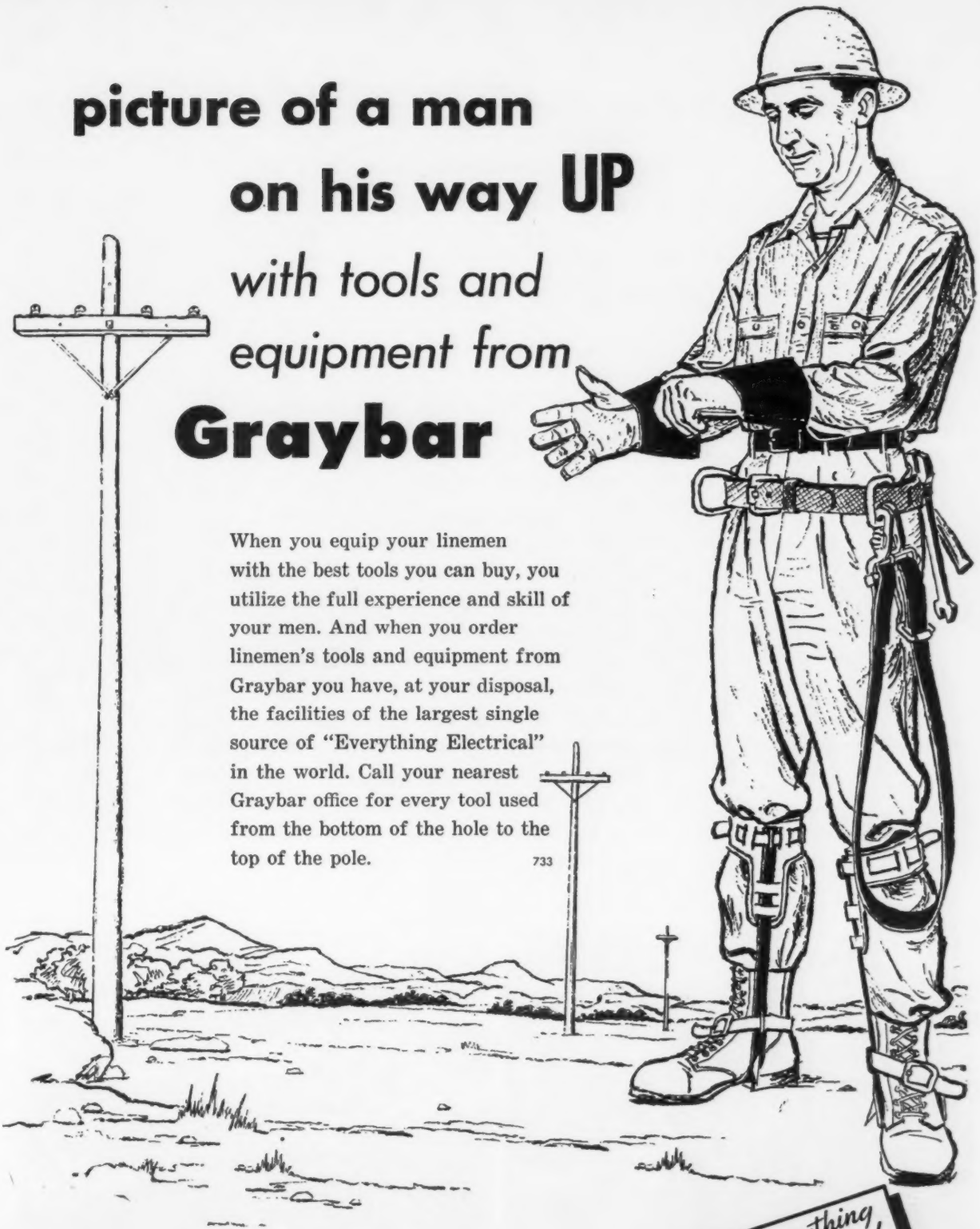
300 Park Avenue, New York 22, N. Y.

picture of a man on his way UP

with tools and equipment from

Graybar

When you equip your linemen with the best tools you can buy, you utilize the full experience and skill of your men. And when you order linemen's tools and equipment from Graybar you have, at your disposal, the facilities of the largest single source of "Everything Electrical" in the world. Call your nearest Graybar office for every tool used from the bottom of the hole to the top of the pole. 733



Call Graybar first for...

GRAYBAR ELECTRIC COMPANY, INC.
420 Lexington Avenue, New York 17, N. Y.

Graybar Everything Electrical Graybar Electric Company

IN OVER 130 PRINCIPAL CITIES

Another sound reason for buying J-M No.55 Cable Fireproofing Tape:

"It not only earned us praise –but saved our profit on a highly competitive bid!"

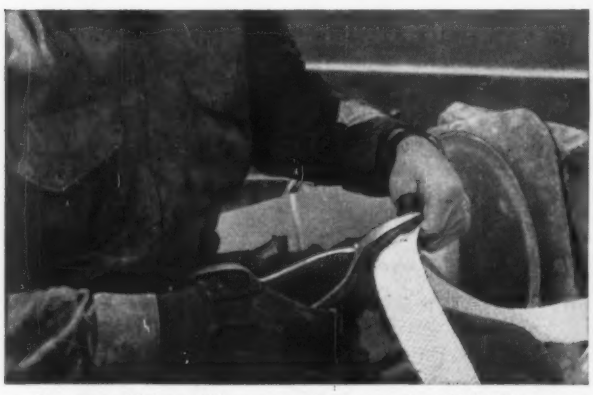
. . . states Mr. E. H. Lovette, President, Lovette Electric Construction Co., Durham, N. C.

"On one of our many military airfield installation jobs from Georgia to Iceland," states Mr. Lovette, "we had to pump out 78 manholes filled with water before starting our electrical work. This meant that the cables had to be wrapped in the shortest possible time to complete the job on schedule . . . and keep us out of the 'red'.

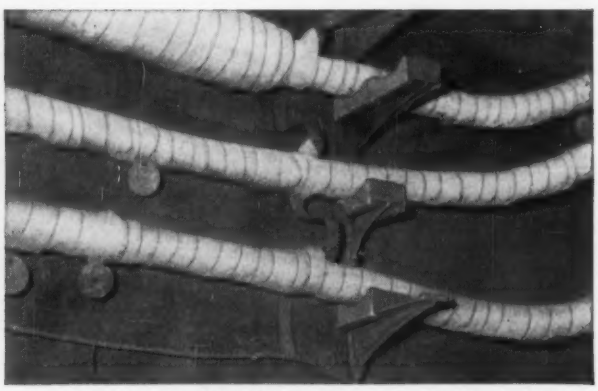
"Using two layers of J-M No. 55 Cable Fireproofing Tape, ½ lap, and tying them with copper wire, we only had to make one trip down each manhole. The savings in time and labor more than offset the slight additional cost of the J-M tape, and enabled us to come out with a profit.

"When a porcelain pot head blew up causing a fire at a switch gear station, the J-M No. 55-covered lead cable was practically unaffected though the fire melted the porcelain and copper. Engineering officers were so impressed that they asked us to use J-M No. 55 Tape on other jobs at their base."

It will pay *you* to use J-M No. 55 Cable Fireproofing Tape made of *asbestos* to defy fire. In an economical thickness, silicone impregnated, it repels corrosive waters and solvents. Write for Brochure TX-6A to Johns-Manville, Box 14, N. Y. 16, N. Y. In Canada: Port Credit, Ont.



No special labor skills are required to apply J-M #55 Tape. Special tools or training are not needed. Here a Lovette workman is cutting tape to protect cable in manhole at an important U. S. air base.



Finished job using J-M #55 Tape is neat, stays neat, resists fire and water. This Lovette manhole job, exposed to jet fuel, kerosene, diesel oil and other solvents during air base defueling operations, won praise from base officers.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

Change hats
with your maintenance man . . .

You'll find out . . .

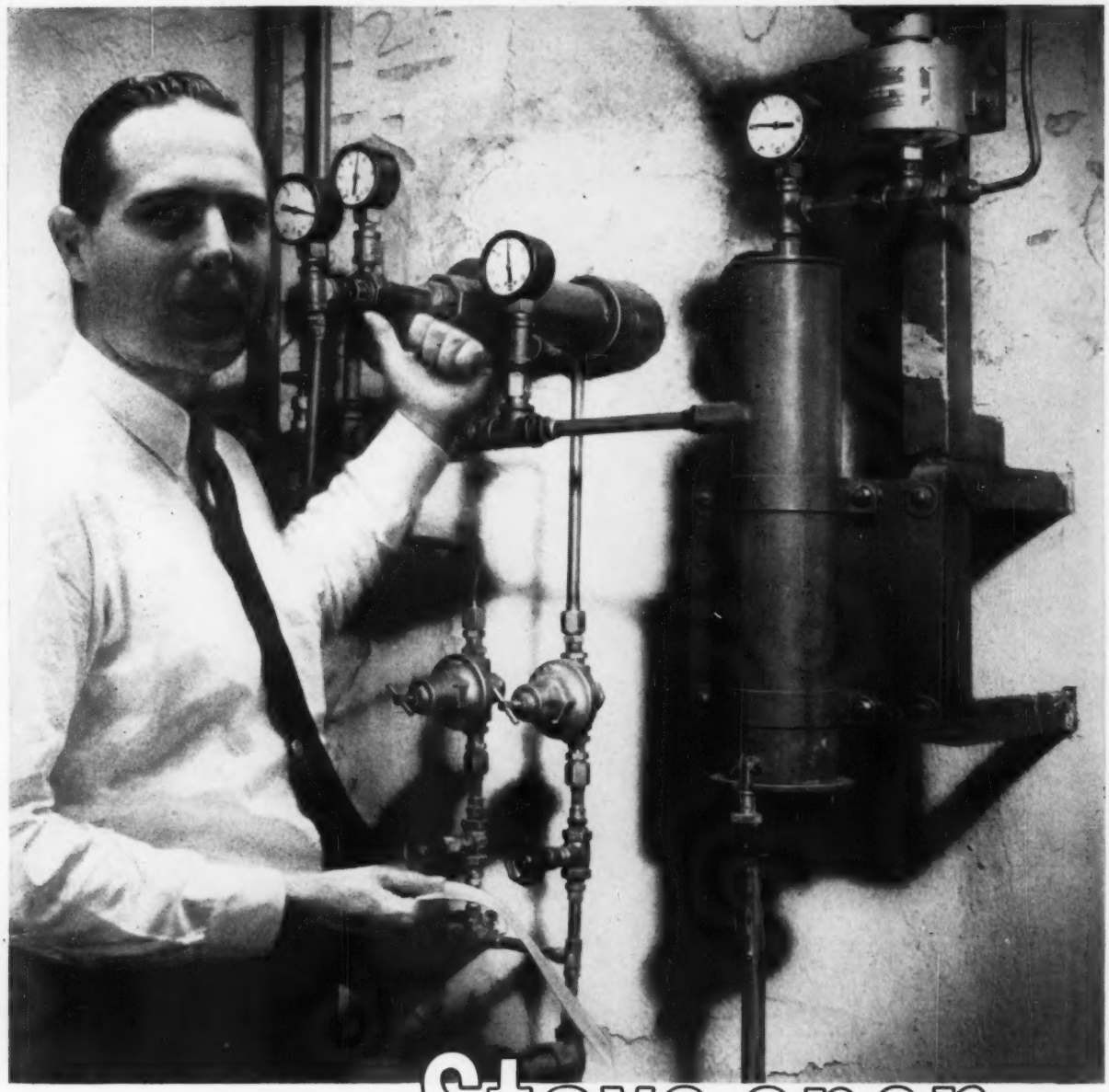
Vertical Lift Magne-blast Breakers have low center of gravity, won't tip over

Find a moment soon to ask the man who maintains your metal-clad switchgear which power circuit breakers are easiest to handle.

He'll tell you he prefers General Electric Vertical Lift Magne-blast Breakers because they have a low center of gravity, aren't awkward and difficult to draw out. Vertical lift Breakers are nearly impossible to tip over, reducing the possibility of breaker damage, injury to personnel and disruption of production. General Electric Company, Schenectady 5, New York. 511-33

Progress Is Our Most Important Product

GENERAL ELECTRIC



This Reverse Jet Probe Stays open

The most critical component of any O_2 analyzing system is its sampling equipment. Unless it gives a continuous, reliable sample, the system can't function satisfactorily.

The L&N O_2 Analyzing System gives you the Reverse Jet Probe and Steam Sampler shown above. A high velocity water jet continuously functions to keep the probe clear. The Steam Sampler cleans all dirt and acid from the sample and pressurizes it for rapid transmission (45 fps). Performance is reliable, requiring only reasonable maintenance.

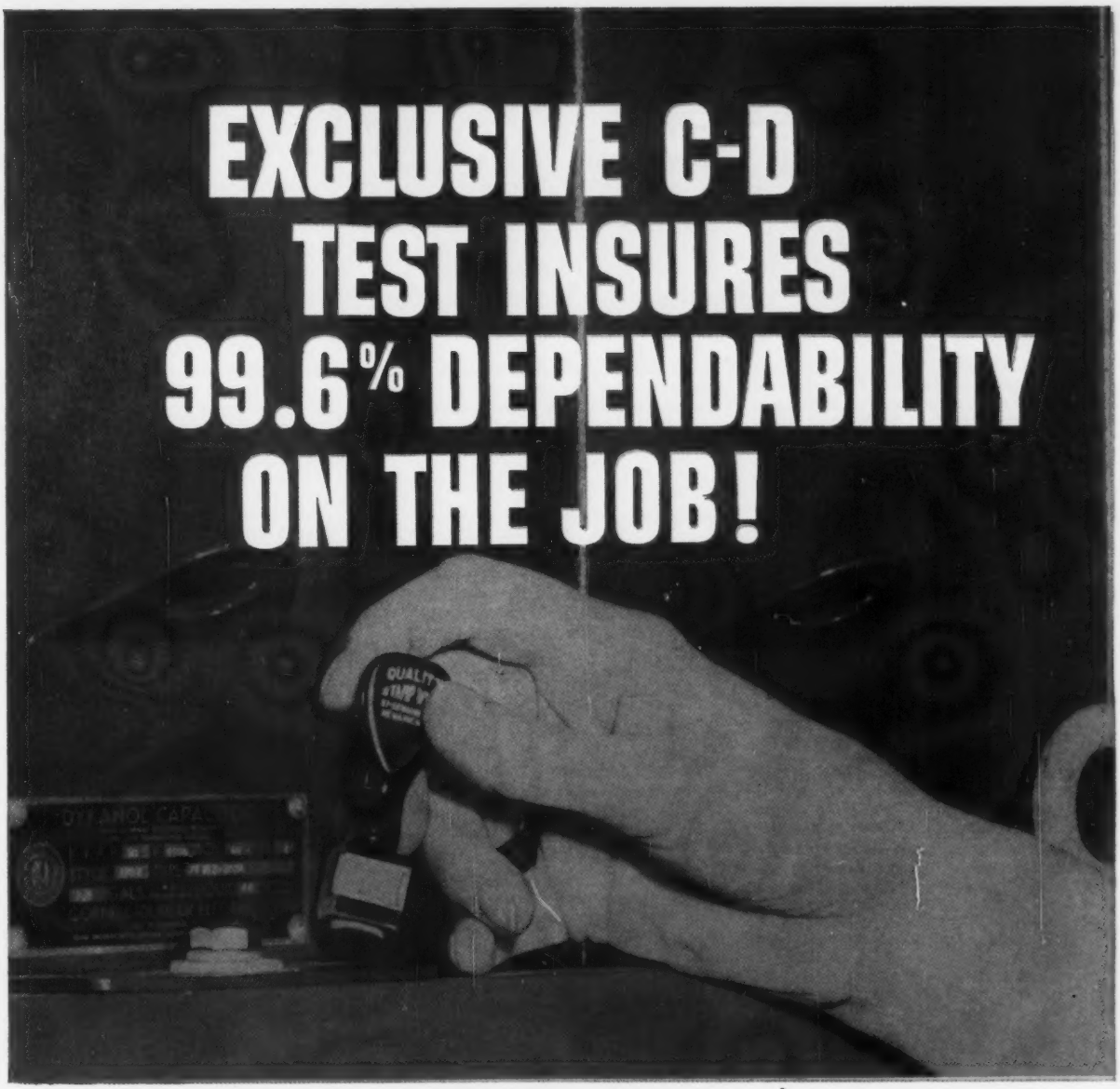
Components of the complete L&N O_2 Sampling and Analyzing System include:

1. *Reverse Jet Probe and Steam Sampler*
2. *Sample Averaging Panel (for multi-probe installations)*
3. *Magnetic O_2 Analyzer*
4. *Speedomax® Electronic Recorder*

For further information, contact your nearby L&N Field Engineer, or write for our O_2 Analyzing Systems Folder to 4938 Stenton Ave., Philadelphia 44, Pa.

O_2 Analyzing System engineered to power plant standards by **LEEDS** Instruments **NORTHRUP** Automatic Controls • Furnaces

EXCLUSIVE C-D TEST INSURES 99.6% DEPENDABILITY ON THE JOB!

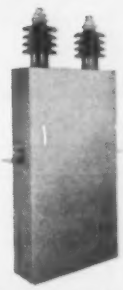


C-D CAPACITORS STAND UP WHEN THE HEAT'S ON.

Before Inspector #7 rubber-stamped his seal of approval on this 50 KVAR power-factor correction capacitor, it (as well as every shunt capacitor C-D makes) was subjected to capacitance, leak, dielectric and energization tests. The energization test—*exclusive* with C-D—puts the unit through an hours-long, full-voltage "heat run" that duplicates the same conditions the capacitor meets in the field.

Since most capacitor failures occur during the first few hours of operation under normal voltage, frequency, wave form and temperature conditions, you can be sure that if the unit passes the tests (and it *must* or we wouldn't ship it) it will have a long service life. Does it stand up? C-D capacitors deliver an unbeatable *99.6%-sure performance in the field.*

Invest your purchasing dollar in *internal* quality—the only place it really counts. See a C-D sales engineer today. Write to Cornell-Dubilier Electric Corporation, South Plainfield, New Jersey.



15, 25, 33.3, 50 and 100 KVAR capacitors for every application, with lowest dielectric unit stress, highest major insulation level and power losses considerably below the NEMA limit of 3.33 watts/KVAR.

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS

how to coordinate SMD Power Fuses for maximum protection

a case study using a new "step-by-step" technique

A common error in fusing the primary of a power transformer is the selection of a fuse of such a speed and ampere rating that the full protection capability of the modern fuse is not put to use.

Properly selected, a modern power fuse can provide for

1. system protection,
2. transformer protection against secondary faults, even line-to-ground,
3. use of transformer short-time daily overload capability,
4. use of transformer short-time emergency overload capability, and
5. complete and precise coordination with other overcurrent devices.

The selection of the right fuse, however, has not been easy, since there has been until now no commonly and consistently agreed upon method of coordination; and only meager information about fuse performance has been available.

Consequently, a new "step-by-step" method for power fuse coordination has been developed by S&C. Supported with all necessary power fuse performance data, this method utilizes the full protection capability of the *modern* power fuse; furthermore, it lends itself to general acceptance and universal use because its development was based on the realistic recognition of

1. the duties the user desires to impose today on a power fuse, and
2. the contradictions in power fuse selection work—the need for simplicity on the one hand and the need for precision on the other.

The case study which follows illustrates the new step-by-step method. It concerns the selection, specifically, of the proper SMD Fuse Unit for application on a power transformer primary.

• • • •

Case Data:

Transformer Bank:
7500 kva, 3-phase, self-cooled.
Primary voltage: 69 kv delta
Secondary voltage: 7.2/12.47 kv wye

Short Circuit Maximum:
Primary: 750,000 kva
Secondary: 80,000 kva (bus fault)

Secondary Breaker:
Ampere Rating: 1200
Reclosing Time: 10-40-100 sec.
Relay-breaker characteristic shown by curve, Figures D and G

Procedure:

Using the S&C Data Bulletin 262, open the front cover to the step-by-step outline shown in Fig. A.

Step 1: Select voltage rating of fuse to equal or to exceed line-to-line voltage of the system—69 kv.

Step 2: Check for adequate interrupting rating (Fig. B). Since the maximum available short-circuit is 750,000 kva, the correct fuse unit is SMD-2.

Step 3: Establish the minimum ampere rating of the fuse unit. In this case use the table for self-cooled or water-cooled power transformers (Fig. C). *(Similar tables are provided for forced-air-cooled power transformers and for potential and distribution transformers.)* The fuse unit ratings in this table have been selected to carry normal short-time daily overloads of the magnitudes established by ASA in the publication, "Guide for Loading Oil-Immersed Distribution Transformers and Power Transformers." No *additional* allowance need be made. Per Fig. C under the proper voltage (69 kv) and proper kva (7500), the correct fuse unit ampere rating is 100E.

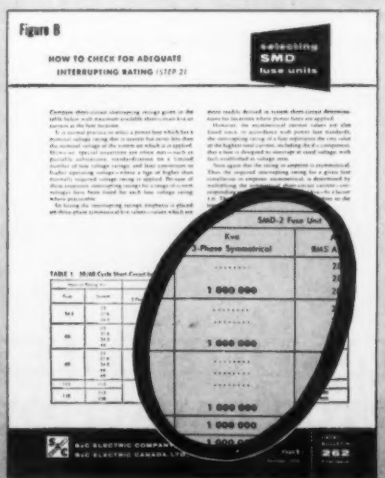
Step 4: Check coordination. Here are two ways: (1) Rule-of-Thumb Method (satisfactory in most cases) and (2) Precise Method (used when the Rule-of-Thumb Method apparently indicates that coordination is impossible).

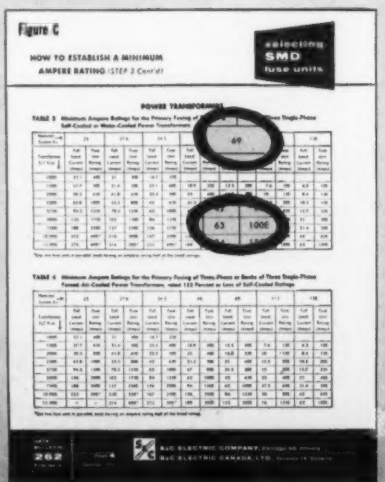
SECONDARY FAULTS—RULE-OF-THUMB METHOD, FIGURE D.

First: Establish the fault conditions under which coordination is to be checked and compute the fault current levels. In this example, a 3-phase secondary bus fault is assumed, resulting in a primary fault current of 680 amperes (see ① in Fig. D).

Second: At this fault current level, read from the time-current characteristic curve the minimum melting time for this fuse unit, 100E amperes—Standard Speed assumed. This gives Point ② in Fig. D of 0.49 seconds.

Third: Multiply this time by .55—giving 0.27 seconds—thus establishing Point ③, the allowable minimum margin between fuse and breaker-relay curves. The factor .55 makes allowances for variations in ambient temperature and for full preloading of the fuse,





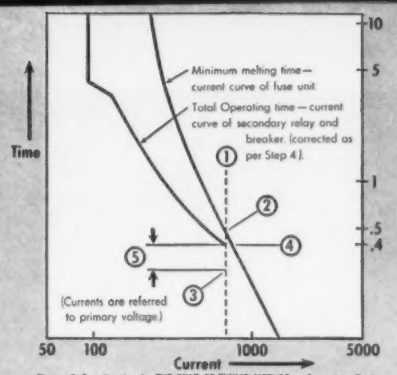
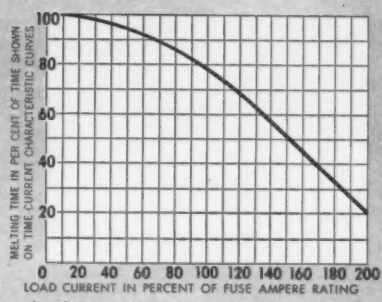


Figure D. Coordination by THE RULE-OF-THUMB METHOD — Secondary Faults


MELTING TIME IN PER CENT OF TIME SHOWN ON TIME CURRENT CHARACTERISTIC CURVES
100
80
60
40
20
0 20 40 60 80 100 120 140 160 180 200
LOAD CURRENT IN PERCENT OF FUSE AMPERE RATING
Figure E. Preloading Adjustment Factors — Standard and Slow Speeds

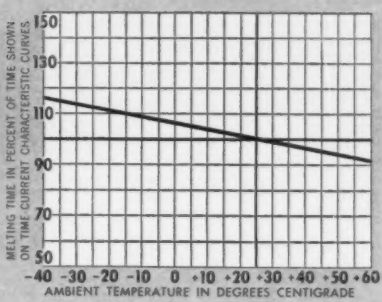


Figure F. Ambient Temperature Adjustment Factors

even from daily overloading of the transformer bank.

Fourth: Read from total operating time-current characteristic curve of secondary relay-and-breaker the operating time, Point ④, for this current level—0.40 seconds.

Conclusion: Coordination is not obtained since the time of Point ④ exceeds that of Point ③ by the amount shown at Point ⑤.

The next step is to recheck coordination, assuming a *Slow Speed* 100E ampere fuse unit. Here again, using the Rule-of-Thumb Method, coordination is not obtained. At this point, rather than to select a higher ampere rating which would sacrifice transformer protection, recheck coordination by the Precise Method.

SECONDARY FAULTS—PRECISE METHOD (an alternate to the Rule-of-Thumb Method), FIGURE G.

This method involves a comparison of the time-current characteristic curves of the selected fuse unit and the secondary breaker-and-relay *after both curves have been corrected* for the various factors that affect coordination. (See Fig. G below.) Factors for correcting relay and breaker curves are obtained from relay and breaker manufacturers.

The factors which apply to the fuse units are discussed below. They are:

- Adjustment for Preloading (see Fig. E above)
- Adjustment for Ambient Temperature (see Fig. F above)
- Allowance for the effect of cumulative heating and cooling of the fuse element during successive breaker operations (heating while short-circuit current flows, then cooling between breaker operations). Where the open-circuit time interval is less than ½ second, no allowance for cooling of the element is necessary; where the interval is 2 seconds or more (as it is in this case), the element will cool to a degree where cumulative heating need not be considered. (For intervals between ½ and 2 seconds, the full details on cooling time allowances are found in Data Bulletin 262.)

In this particular fusing problem, coordination with the secondary breaker-and-relay has been obtained by the Precise Method, since, in Fig. G, the time ② on the corrected fuse curve is greater than the total relay-breaker time ③ for this current level. This difference is indicated by ④. Were this not the case, using a Standard Speed Fuse unit, then a recheck would be made, using a fuse unit of the same ampere rating but Slow Speed. Do this rather than going to a higher ampere rating, since a higher rated fuse unit offers less protection to the transformer. If the Slow Speed does not coordinate satisfactorily, *then* recheck, using the next higher ampere rating in the Standard Speed.

PRIMARY FAULTS, FIGURE H.

For both Rule-of-Thumb and Precise Coordination Methods the same practice is used. No adjustments or margins are required. Coordination at fault level ① will be obtained where the total clearing time of the fuse unit ③ is equal to or less than the tripping time ② of the line breaker relay. ④ Indicates margin.

Step 5: Check for Short-Time Emergency Overload Operation.

These curves (Fig. I) show the ability of an SMD Fuse Unit to carry emergency overloads after carrying rated load. This overload situation arises, for example, when one transformer on a duplex substation is out of service for repairs or maintenance, putting the entire load on the other transformer and its fuses. The curves are based on an ambient of 30°C and represent the maximum *nonrepetitive* overload (in per cent of ampere rating) that an SMD Fuse Unit can carry for a given time without impairing its ability to perform properly. For each degree above or below 30°C, the capability may be adjusted 0.3 per cent.

• • • •

The above case study is a brief summary of a fusing problem solved by using the complete 12-page Data Bulletin 262 entitled, "Selecting SMD Fuse Units," published by S&C Electric Company. This bulletin with 8 Time-Current Characteristic Curves and a comprehensive text on coordination is yours for the asking.

S&C Electric Company, 4421 Ravenswood Avenue, Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario.

S&C ELECTRIC COMPANY

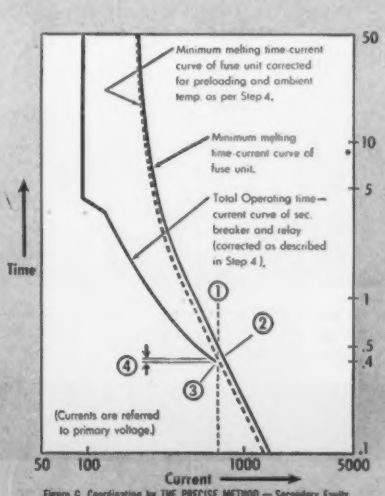


Figure G. Coordination by THE PRECISE METHOD — Secondary Faults

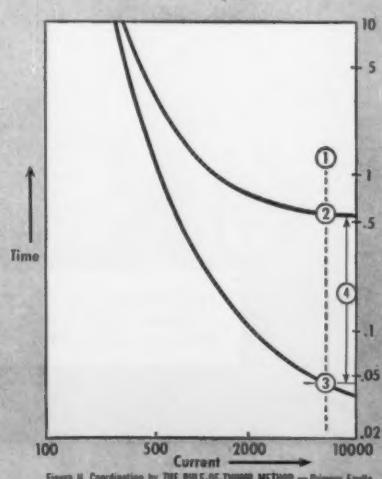


Figure H. Coordination by THE RULE-OF-THUMB METHOD — Primary Faults

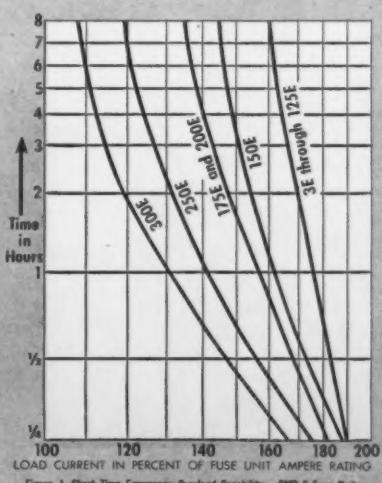


Figure I. Short Time Emergency Overload Capability — SMD-2 Fuse Units

FIELD SERVICE ONLY is required for the addition of some new accessories. Here, a Sudden Pressure Relay, preassembled to a new manhole cover, is installed quickly and easily. Relay protects against extensive damage due to internal fault.

new POWER TRANSFORMER MODERNIZATION PROGRAM CUTS OUTAGES AND COSTS

Helping you cut costs and protect your power transformer investment is the sole purpose of the new Westinghouse Preventive Maintenance Through Modernization Program. It is based on the fact that the best way to reduce outage expense is to replace obsolete parts or add devices in accordance with modern practice. It is organized to provide the exact degree of modernization you need, from simple replacement of parts to complete rebuilding and uprating of transformers.

Replacement of Obsolete Parts. Use of modern components to replace outdated parts before they fail will provide a great increase in reliability of units otherwise fit for continued service.

Use of New Accessories. The latest developments, such as gas detectors, help solve old operating problems and can be purchased at little cost.

Addition of Protective Devices. Equipping your power transformers with modern protective devices assures better continuity of service. Various types relieve dangerous pressures, detect faults and indicate other abnormal conditions.

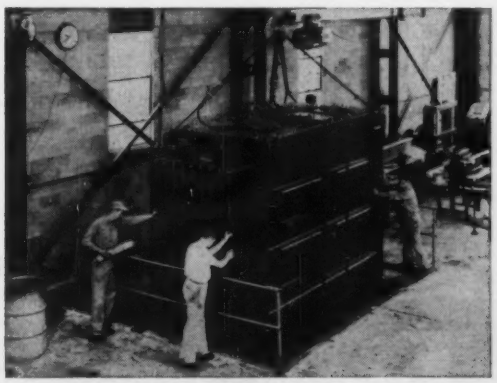
Oil Preservation Equipment. Many excellent protective systems can be installed to maintain high dielectric strength of transformer oil.

Methods to Increase Rating. Modification of present cooling system permits an increase in rating of older units. Engineering analysis is provided to determine rating increase possibilities.

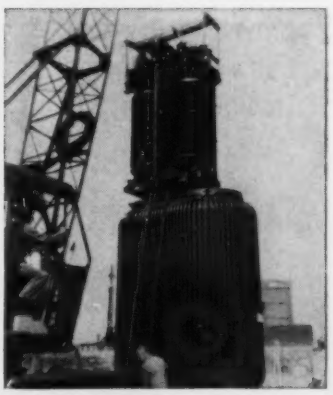
Westinghouse backs this new modernization program with the full facilities and "know-how" of its 40 Manufacturing and Repair Plants throughout the country. Your nearest Repair Plant can provide efficient service in all phases of the program.

Westinghouse field service engineers will be glad to study your power transformers and recommend improvements to increase performance and reliability.

For full information, call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70904



Power transformer is shown being lowered into pit for detanking in a Westinghouse M & R Plant. These plants can perform modernization operations which cannot be undertaken in the field.



Here, Westinghouse service engineers detank a power transformer in the field.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

KPF switches

Trouble-free Simplicity

of design, of operation

INSTALL KPF switches more quickly on hot or dead lines, at less cost. Just bore holes in crossarms, mount phase units, connect conductors. No precision requirements, no heavy extra mounting structures, no temperamental complex mechanism to bind, freeze, malfunction or need lubrication.

Rugged, lightweight KPF switches have proved their dependability and economy in half a century of major utility service. Make a test installation on your system—this month.

Fully closed.
Bell crank on crossarm, operated by control rod, will rotate switch blade arm clockwise away from stationary arm holding switch contact clip.

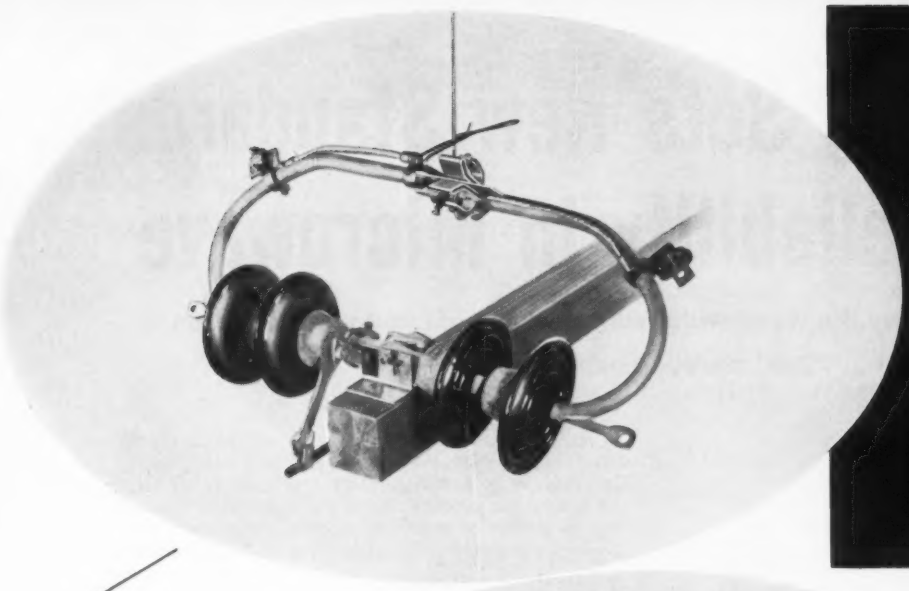
Switch blade arm partially rotated.
Switch blade has separated from clip. Quick-break whisker carries current, prevents arcing.

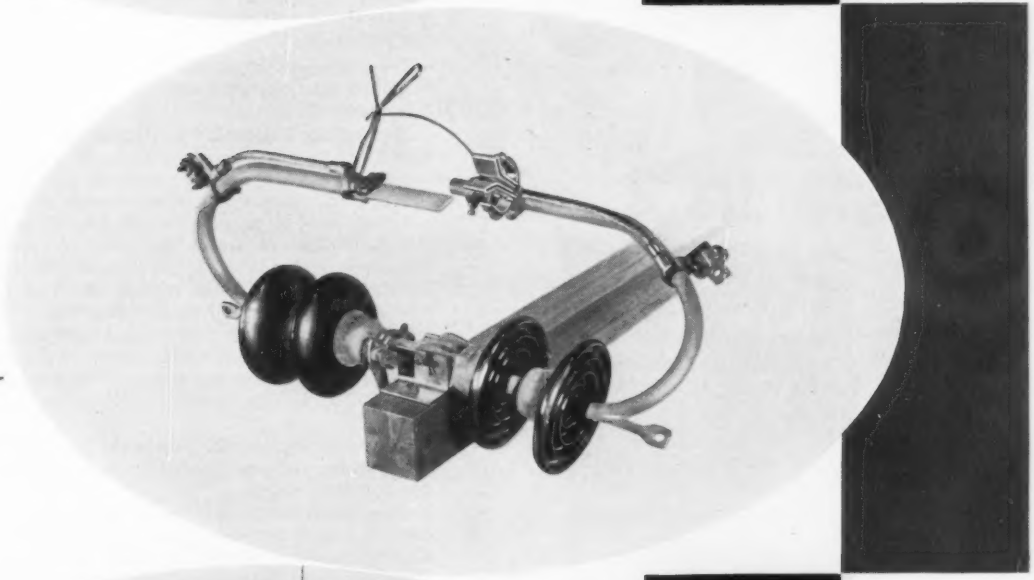
Switch fully open.
Quick-break has snapped free instantly, preventing arcing. KPF switches operate smoothly despite icing, crossarm warpage; never need lubrication.

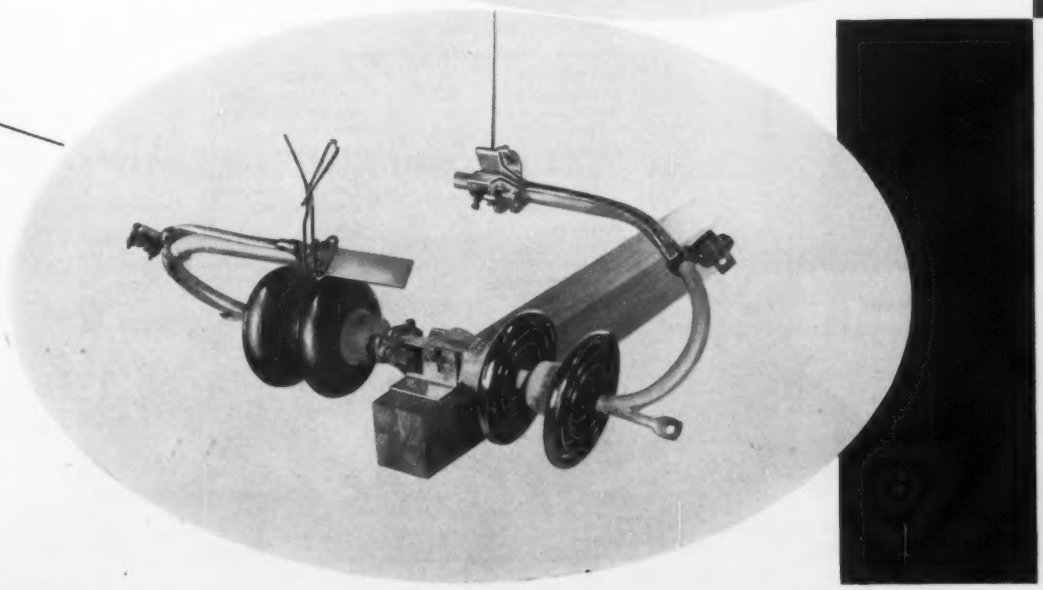
KPF
AIR BREAK SWITCHES
Standard for half a century

KPF ELECTRIC COMPANY
P.O. Box 1257E • Stockton, California
HOward 4-8381

5214

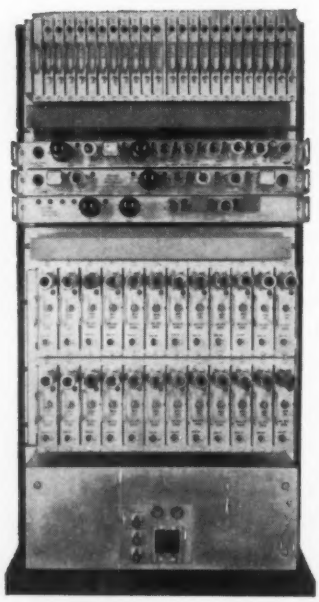




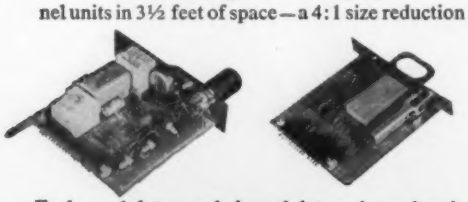


Kellogg Sets New Standards of Reliability in Microwave

Backed by the world-wide technical, manufacturing, installation and operating experience of ITT



New MICROPLEX provides 23 plug-in channel units in 3½ feet of space—a 4:1 size reduction



Each modulator and demodulator channel unit features printed circuitry.

Microwave was pioneered by ITT in 1931 with the Channel crossing from Calais to Dover. Today Kellogg Microwave is achieving new levels of reliability: 99.998%, far superior to wire line systems! Operating in dozens of installations throughout the world, Kellogg's *complete* communications package includes:

- *Microwave* — operating in the 2,000 and 10,000 megacycles bands.
- *Terminating Equipment*—for automating functions, including teletype, telemetering, remote control, data transmission.

Part of the Kellogg 10-C Microwave System is the new 10-C-2 "Microplex": a 23 or 45 channel PTM multiplexing equipment. It features printed circuits, miniaturized components, minimum maintenance, and occupies only three-and-one-half feet of rack space. All demodulators are semi-passive—only one tube per channel; modulators are passive—no tubes. The 23 channels use 41 tubes with an input of 180 watts —a 5:1 reduction in power consumption.

MICROPLEX may also be packaged in one seven-foot rack to provide 45 channels; or 23 channels with two-wire termination and tone signaling. Signal crosstalk is 62 db and signal-to-noise (F1A) is 70 db for 23 channels.

Our engineering staff is always at your service—ready to discuss your communications problems. Write for complete details.

Kellogg Switchboard and Supply Company,
6650 S. Cicero Avenue, Chicago 38, Illinois.
Communications Division of International Telephone and Telegraph Corporation.

Regional Offices and Warehouses:

CALIFORNIA
23 Broderick Road
Burlingame, Calif.
OXford 7-5780

GEORGIA
1594 Southland Circle, N.W.
Atlanta 18, Georgia
SYcamore 4-2441

ILLINOIS
4600 So. Tripp Ave.
Chicago 32, Illinois
CLiffside 4-4300

KANSAS
7th & Sunshine Road
Kansas City 15, Kansas
MAyfair 1-4418

MINNESOTA
6100 Excelsior Blvd.
Minneapolis 16, Minn.
West 9-6715

NEW YORK
327 North West Street
Syracuse, New York
HArrison 2-9251

OHIO
1555 West Fourth Street
Mansfield, Ohio
LAfayette 4-6511

TEXAS
1515 Turtle Creek Blvd.
Dallas 7, Texas
RIverside 7-5191

EXPORT 157 Prospect Street, Passaic, New Jersey
PRescott 3-5100

KELLOGG
CHICAGO, ILLINOIS
Communications Division of ITT

The Electrical Week

FUTURE NEWS ▶ **Another segment of the electrical industry will be the target** of Sen Estes Kefauver's (D-Tenn.) anti-trust and monopoly subcommittee. The Tennessee senator has announced hearings on TVA charges of identical bids from electrical manufacturers for materials and equipment. Industry sources expect a replay of last year's administered price investigations in the steel industry.

LATE NEWS ▶ **Labor Notes** . . . Wisconsin Electric Power and IBEW agree on wage hike of 3.60%, which reflects conversion of 1958 cost-of-living adjustment, now discontinued . . . Ohio Power grants 4½% increase to five plants, three represented by Utility Workers, and two non-union . . . Detroit Edison settles with Utility Workers on 3½% hike, eliminating cost-of-living escalation clause.

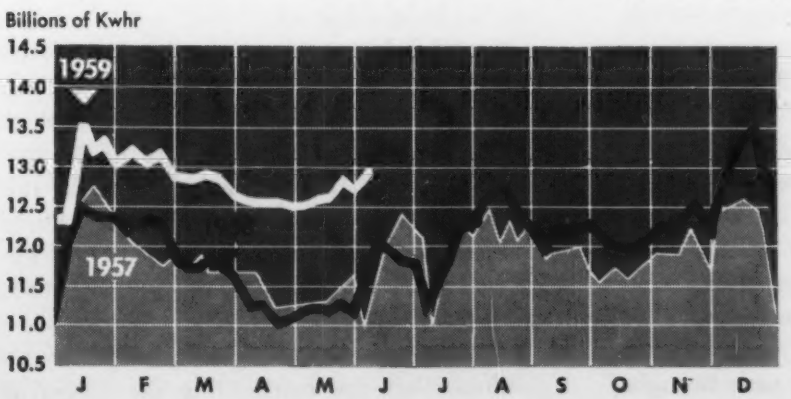
Washington Wire . . . Chairmen of four Senate committees—Foreign Relations, Interior, Public Works and Water Resources—criticize Interior Dept's "blatant attempt" to exclude public power representatives from U. S. delegations inspecting Soviet hydro plants, particularly NRECA's Clyde Ellis and APPA's Alex Radin . . . Senate confirms Frederick Stueck renomination to FPC.

General Public Utilities subsidiaries form A-power corporation to operate 20,000-kw (t) reactor. Firm will be known as Saxton Nuclear Experimental Corp.

Foster-Wheeler, North American drop merger plan. Reason: studies indicated neither company would get mutual benefits originally expected.

Management changes . . . Allen King, Northern States Power Co president, takes office as EEI president . . . Harry Hanson elected vp and re-elected treasurer at New England Electric System.

WEEKLY POWER OUTPUT—UP 11.5% (Week ending June 6), Kwhr 13,023,000,000



Per Cent Change From Previous Year

	May 23	May 30	June 6
Total U. S.	+14.3	+14.5	+11.5
New Eng.	+12.2	+15.0	+11.3
Mid. Atlantic	+14.1	+20.0	+15.1
Cent. Ind.	+18.7	+21.7	+17.5
West Cent.	+11.6	+10.7	+ 8.3
Southeast	+ 8.8	+ 8.4	+ 6.1
South Cent.	+19.6	+ 9.1	+ 1.1
Rocky Mount	+10.4	+ 3.7	+ 6.5
Pacific			
NW	+19.4	+15.6	+18.7
SW	+12.1	+15.4	+14.9

Seasonally Adjusted Index 254.9
Week Ago 260.2 Year Ago 229.2

Source: Edison Electric Institute

Preview of this Issue

EVENTS ▶ **Rockefeller initiates sweeping study of New York's power needs,** appointing seven-man task force to report in six months. Group includes three heads of power companies, is led by former chairman of N. Y. Power Authority (p 40) . . . Public Works Appropriations bill and AEC Authorization bill clear Congressional committees (p 41) . . . Arizona Public Service and Philadelphia Electric share top award in Reddy Kilowatt Annual Report Contest (p 42).

ENGINEERING ▶ **Ohio Edison electrically heats and cools its new service building.** It plans to obtain cost comparisons between the new building and two similar, but conventionally heated ones, in the same area. Details of this week's cover story on **page 46** . . . GE begins construction of Project EHV near Pittsfield, Mass. Scheduled to be energized in May of 1960, the line will help in making a thorough study of EHV transmission systems and their future development (p 48) . . . Normal relay settings can handle cold-load pickup (p 52).

PROCUREMENT & PRODUCTS ▶ **Aluminum prices grow firmer** . . . Electric utilities' use of coal will rise 34% in next five years, says coal company exec . . . Research and testing projects now under way will guide future utility procurement practices for some 33 different classes of materials (p 62).

Politics and Public Power

COAL'S FUTURE AND POLITICS

Utility company officials and other users and producers of coal want to keep the coal industry alive, and have joined together to try to cure coal of some of its ills.

There's lobbying in the process of diagnosis and prognosis, and nobody denies it. The lobby is simple and direct:

- Give coal a break in those areas it can still effectively serve; and
- Don't give government help to competing fuels.

That is the platform of the recently established National Coal Policy Conference, in which producers, mine union officials, and users—the most prominent of which is Philip Sporn of American Electric Power—joined in a common cause.

The efforts of the new group were brought to bear at the National Coal Association convention in Washington, June 3-4. Delegates talked about their desire for fairness in government fuel policies, and activities of the producer-worker-user lobby were reported.

Coal producers now regard electric utilities as their best market, and expect them to remain so for a long time. Utility generation studies back them up.

Coal has been able to survive the recent loss of markets, said Island Creek Coal Co President R. E. Salvati, "primarily because of the rapidly increasing use of coal by electric utilities." The 155 million tons used by the electric power industry in 1958 was nearly 37% of total sales, and this market will expand to 205 million tons, or 45% by 1963, Salvati estimates.

Here is what the coal producers plan:

First, they are marshalling the forces of

MANUFACTURERS ▶ **Westinghouse exciter eliminates brushes, rings, and commutators.** The 180-kw, 250-v rotating rectifier is for an ac generator being built for West Penn Power . . . GE develops hydrogen-oxygen fuel cell which has a reported thermal efficiency of over 60% **(p 64).**

NEW EQUIPMENT ▶ **Compression X-taps are designed for mid-span tapping** where opposite right-angle service taps are required . . . DC motor features water-to-air heat exchanger . . . Portable radiophone is designed to block out interference by other radio systems on the user's channel . . . Extension bracket keeps wires clear of transformers **(p 83).**

SELLING ▶ **A national electric commercial cooking program may be the result** of recommendations made at the Commercial Cooking Conference by Detroit Edison VP E. O. George **(p 88).**

MANAGEMENT ▶ **Highway bulldozers are piling up tougher relocation problems,** particularly on the question of who should pay for moving utility facilities. A recent U. S. Supreme Court action upheld a Tennessee decision that allocation of state funds for utility relocations was invalid. Meanwhile, highway men battle the proposed use of highway funds for anything other than road building **(p 75).**

labor and customers—including railroads and utilities—into the new Conference. This group aims to bring pressure in Congress and on the Administration to cut down further on residual-oil imports; to stop or slow down federal subsidization of nuclear power plants; to prevent so-called "dumping" of natural gas in industrial markets; and finally, to lift West German curbs on U. S. coal imports.

Second, they want to set up an Administration fuels policy study group to review government fuels regulation and policies.

Third, the Bituminous Coal Institute is launching a market campaign of its own aimed at getting customers to modernize their coal-burning plants and then to recapture those customers who have switched to competing fuels.

The Policy Conference lobby, which will spend about $350,000 this year, will try to correct what its chairman, Consolidated Coal Co's George Love, says is a sorry lack of influence in Congress. Love told the Convention his group was shocked during talks that led to the lobby's formation to learn "how few votes in Congress coal could deliver."

Despite the hoped-for success of these campaigns, and the increase in utility use of coal, Island Creek's Salvati underscored coal-market losses by predicting that even utilities would continue to switch to other fuels. But the future loss should be "slight," according to Salvati, and may be offset by the expanding electric home heating market. (Home heating can boost residential kwhr consumption as much as sevenfold, and with it, the utility use of coal.)

But one thing is certain: Utilities will be pulled and hauled in the coal contest: Pulled one way by the lure of competing fuels, hauled back by their old stand-by, coal.

Executive Reader

Pressures stemming from big federal budgets are slowly but inexorably demanding improvements in government managerial philosophy and methods. It seems inevitable that the future will witness increased emphasis on efficiency, decentralization of management responsibility with recognition that control of funds is only a portion of a larger problem, and greater emphasis on accountability. **Harvard Business Review, May-June, 1959.**

Higher ratings and conversions to 12 kv are achieved by re-coring distribution transformers in commercial service shops. Pacific Gas & Electric Co's experience with a 350-unit-per-month program shows that 50% of rebuilt units can be uprated for a 35% overall gain in kva capacity. **H. H. Scoville, Transmission & Distribution, May 1959.**

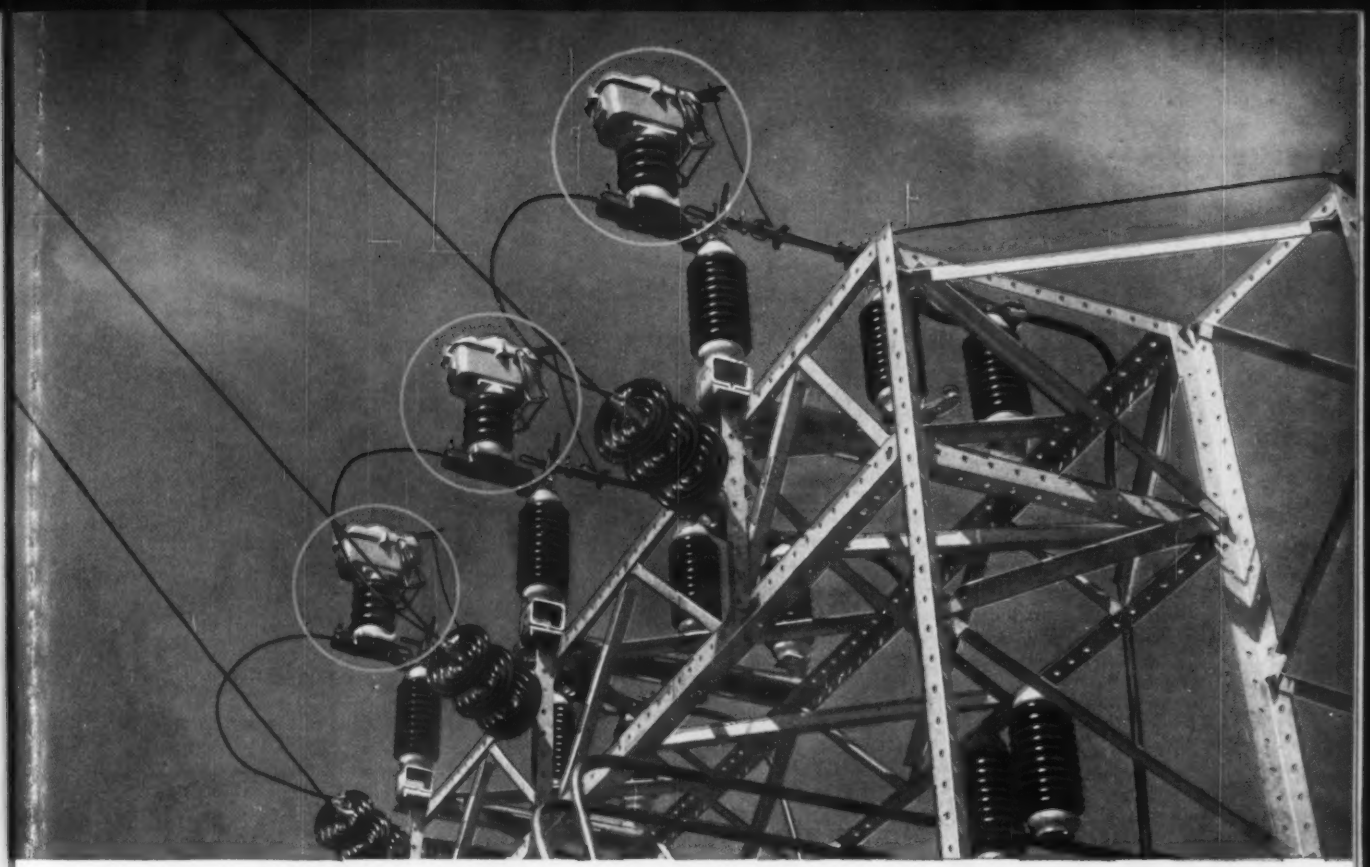
NUCLEAR NOTES

European electric utilities have expressed interest in building atomic power reactors under the US Euratom cooperative program. Five letters of intent have been received representing utilities or utility groups in West Germany, Italy, The Netherlands, and a French-Belgium combine. Industry experts doubt more than two or three intentions will be firmed up by September 1 deadline. **Atomic Energy Commission.**

Doubt now mounts in Washington that the 1 million (e)kw power reactor goal of the Euratom program will be reached by 1963, even though AEC sees response indicative of wide interest.

With availability of fossil fuels now enough to remove emergency status from Euratom power reactor program, and still growing, JCAE is being told 1 million kw Euratom goal is no longer important. Thus a major shift in direction of Euratom goal is now being urged from fission power development to integration of European scientific and technical community on broad front of research projects. **Robert McKinney, former US representative, International Atomic Energy Agency.**

Spherical steel containment vessel for the nuclear reactor 275-Mw power station being built at Indian Point, N. Y., by Consolidated Edison should be adequate to prevent undue health and safety hazards to the public arising from any credible accident. Notice of intent to approve specifications of the steel vessel, which will be enclosed in a separate concrete structure, has been given. **Atomic Energy Commission.**



THE NEW L-M OIL INTERRUPTER provides high-speed circuit interruption on sub-transmission circuits without external arc or flame. The unit costs less than half as much as other interrupters for the same application.

New High-Voltage Oil Interrupter For Only $290 Per Pole for 69 kv

Units cost less than half as much as other interrupters for the same application—$240 per pole for 23 kv and 34 kv, $265 per pole for 46 kv, and $290 per pole for 69 kv.

Now you can get an economical, high-voltage oil interrupter for sectionalizing and switching on sub-transmission circuits. The unit is capable of interrupting load currents, line charging currents, and transformer magnetizing currents. It easily meets NEMA and AIEE standards, including the ice test.

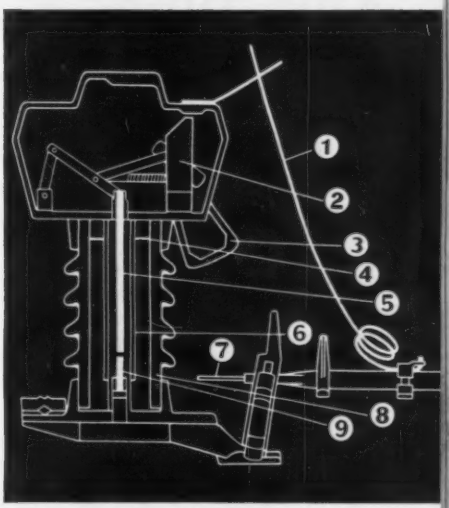
Contacts Separate At High Speed

The L-M interrupter consists of an oil-filled unit housed in a porcelain insulator, and a rod to shunt the current through the interrupter while the main switch blade is being disconnected. As the switch blade rises, it engages a spring trip lever which rises to over-toggle position, causing the contacts within the unit to separate under oil at high speed. The speed of the moving contact is independent of the operation of the main switch blade.

Contacts have long-life copper-tungsten arcing tips. All linkages are made of aluminum for lightness and fast operation. A simple fiber-washer arrangement provides a spiral passage for the pressure-generating arc, forcing oil and un-ionized gas around the arc core as the moving contact is withdrawn. This assures rapid arc extinction at low current values.

Ratings 23 kv Through 69 kv

L-M's new interrupter is available in 23, 34.5, 46 and 69 kv ratings. Continuous current rating is 600 amperes; momentary and short-time current ratings are 40,000 amps. for 10 cycles, and 25,000 amps. for 4 seconds. The unit can be installed on any of L-M's PV switches without altering the original parts. The addition of the interrupter does not change the electrical clearance or the phase spacing of the switch.



Cutaway View of Oil Interrupter

1. By-pass rod
2. Toggle mechanism
3. Trip lever
4. Oil level
5. Moving contact
6. Interrupter
7. Trip rod
8. Bushing
9. Stationary contact

Get Complete Information

Ask your L-M Field Engineer for more complete information on L-M's new high-voltage oil interrupter and on L-M's outstanding power switching equipment. Or write Line Material Industries, Milwaukee 1, Wis.

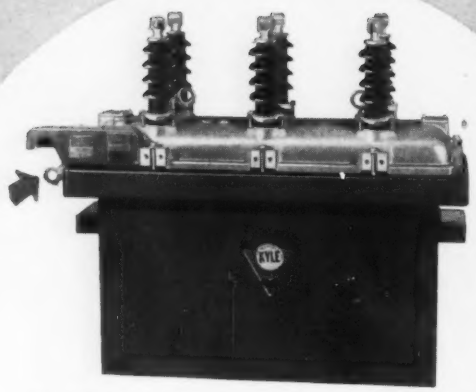
317

LINE MATERIAL Industries

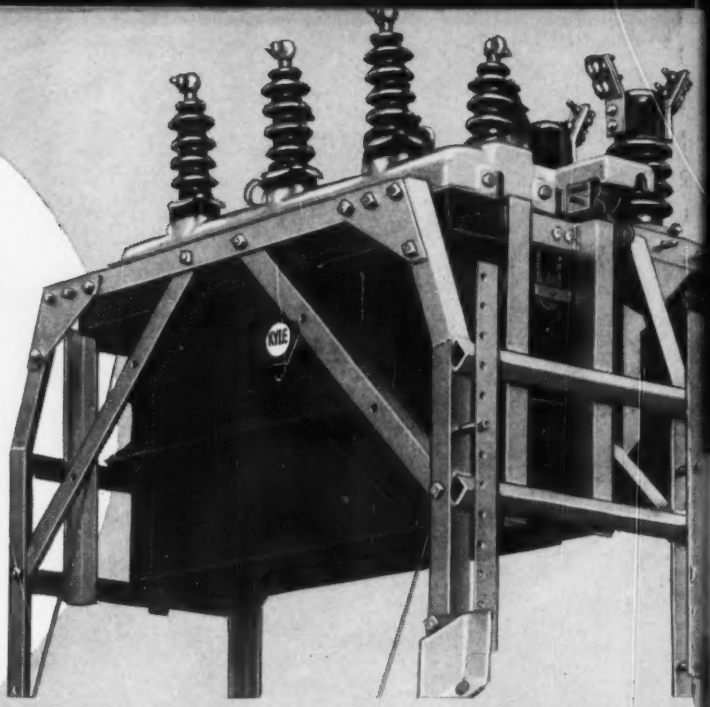
McGRAW-EDISON COMPANY

LM Power Switching Equipment

McGRAW EDISON



KYLE TYPE R heavy-duty 3-phase recloser. Available in 12 current ratings from 25 to 400 amperes, 2.4 to 14.4 kv. Interrupting ratings up to 6,000 amperes at 4.8 kv. Note that the trip-free operating lever functions both for manual opening and manual closing. Further, this lever is a lockout position indicator when in the down position.



KYLE TYPE W heavy-duty 3-phase recloser is rated from 100 to 560 amperes, 2.4 to 14.4 kv; interrupts up to 12,000 amperes at 4.8 kv, 8,000 at 14.4. Can be unbolted from mounting frame easily with common wrenches; no wrench extensions or unusual tools required.

Kyle Types R and W Heavy-Duty Reclosers Offer Unmatched Features and Operation

Dial your operating sequence! Finger-tip, positive, pretested indexed positions for: (1) timing; (2) operating sequence; (3) number of operations to lockout.

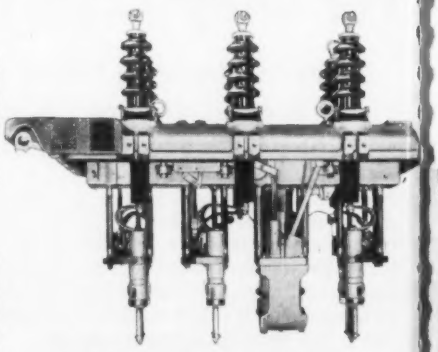
With more extensive recloser engineering and field experience than any other manufacturer, Kyle has produced in the heavy-duty Types R and W reclosers, apparatus that is completely unmatched by any similar products now available.

Kyle reclosers offer many advantages in operation that make coordination easier and more exact; reduce burndowns; and thus improve service continuity.

The Kyle operating mechanism is readily accessible. Contacts are visible and may be inspected when open. Coils may be changed in the field. The number of fast curves may be selected and changed simply by turning a dial. Two retarded curves are precalibrated at the factory, so no "cut and try" adjustments involving expensive testing time are needed if the user desires to change from one retarded curve to the other. Every Kyle Type R and W is completely and accurately factory precalibrated on all of its time-current characteristics, not just the single characteristic specified on the order. Actually, every R and W has over a hundred factory timing-test operations.

Let Us Supply Bulletins

These are some of the many superior design and operating features that make the Kyle Types R and W the best reclosers on the market. Ask the L-M Field Engineer for complete information. A large library of literature is available—on application, operation, and maintenance. He will be glad to supply whatever you can use. Or write Line Material Industries, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.



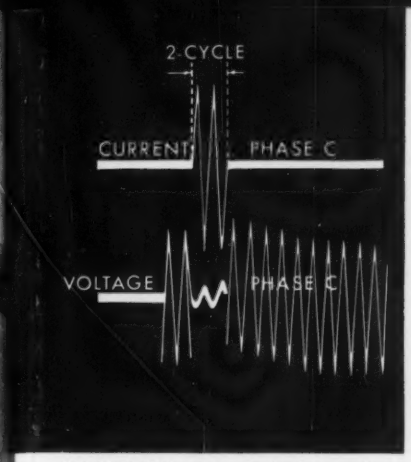
MECHANISM WITH TANK LOWERED. With the Kyle unit, the recloser frame can raise or lower the entire recloser, or lower the tank only, for inspection or maintenance. Kyle reclosers are completely self-contained; no additional external power source is required to operate them.

LINE MATERIAL® Industries

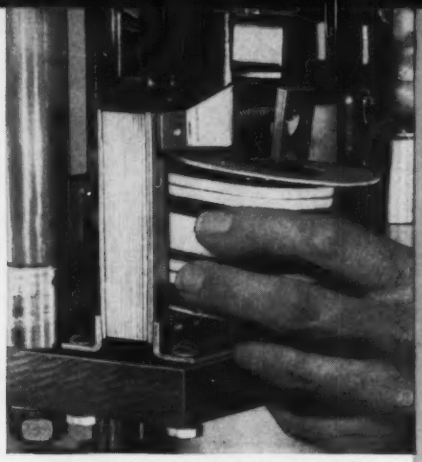
McGRAW-EDISON COMPANY

LM® Kyle® Switchgear McGRAW EDISON

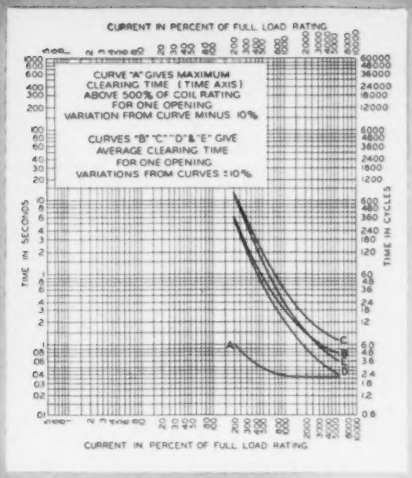
DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT



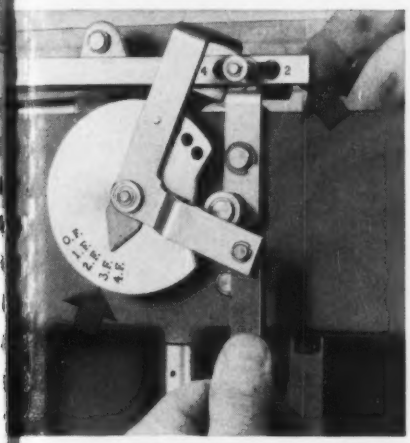
OSCILLOGRAM shows typical example of current interruption. *Maximum* clearing time over most of fault current range for the Type R is 2 cycles; 2½ cycles for the W. This is total, starting at the instant the fault occurs, and includes sensing, operation, and final arc quenching.



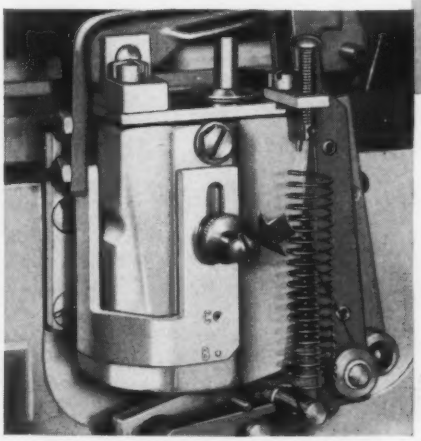
CHANGING THE SERIES TRIP SOLENOID, which determines the tripping current, is easily done in the field. Both reclosers are available in a wide range of tripping currents, affording a wide degree of application and permitting proper feeder protection as the load changes.


CURRENT IN PERCENT OF FULL LOAD RATING
CURVE "A" GIVES MAXIMUM CLEARING TIME (TIME AXIS) ABOVE 500% OF COIL RATING FOR ONE OPENING VARIATION FROM CURVE MINUS 10%
CURVES "B" "C" "D" & "E" GIVE AVERAGE CLEARING TIME FOR ONE OPENING VARIATIONS FROM CURVES ±10%
TIME IN SECONDS
TIME IN CYCLES
A
B
C
D
E
CURRENT IN PERCENT OF FULL LOAD RATING

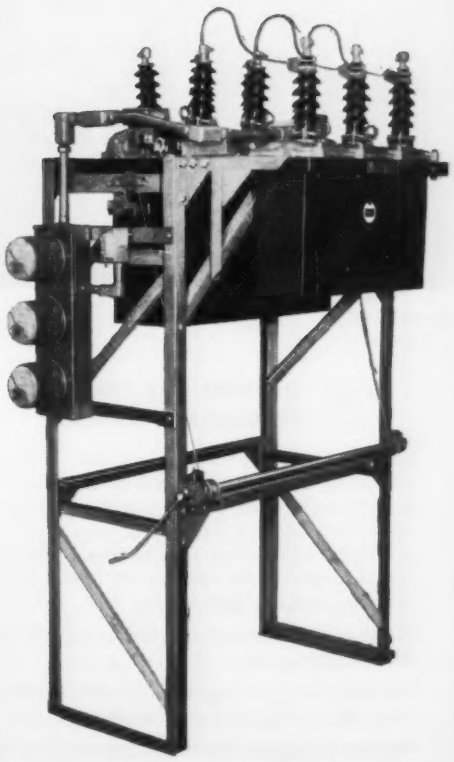
CHOICE OF FIVE CURVES—one fast (instantaneous) and four time-delay curves—is available on phase tripping. Delay curves B and C are obtained with one piston assembly, by simple change shown above. Or, with modification of the piston assembly (not a field operation), the reclosers are available with choice of D or E curves. No "cut and try" adjustment in the field.



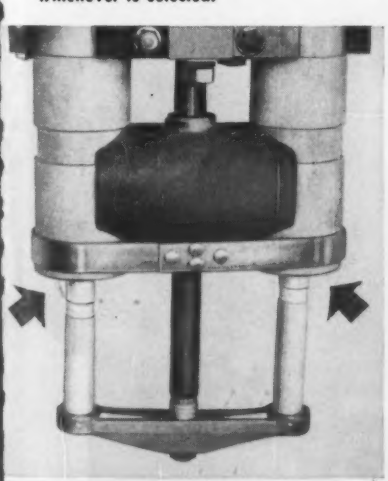
THESE RECLOSERS may be set for 2, 3, or 4 operations to lockout by simply re-indexing the lockout bar. Changing the easily accessible dial permits selection of 0, 1, 2, 3, or 4 fast operations. Any remaining operations to lockout will then be the delayed operations on the B or C curve, whichever is selected.



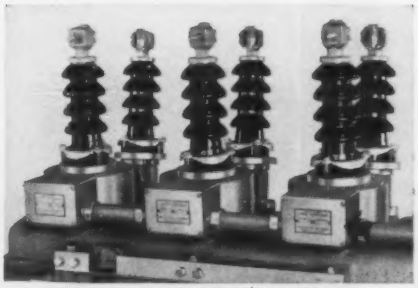
FOR CHOICE OF time-delay curves it is only necessary to loosen this thumb-screw and index the adjustment bracket to the curve desired. Both retarded curves have been test-board-calibrated, and no "cut and try" adjustment is necessary in changing to the other curve.



RIGID SUBSTATION MOUNTING FRAME. Windlass hoists recloser to any desired height without additional equipment. Since entire mechanism is suspended from the head, the recloser frame can raise or lower entire recloser, or lower the tank only, for easy inspection or maintenance.



DOUBLE-BREAK CONTACTS with oil cross-blast arc extinction. In the open position the contact tips are accessible for visual inspection—no disassembling necessary. Contacts cannot fail *closed*.



BUSHING CURRENT TRANSFORMERS are available as an accessory. These are mounted on the *outside* of the tank, where terminals are accessible by means of a screw plate. No untanking necessary.

LINE MATERIAL® Industries

McGRAW-EDISON COMPANY

Kyle® Switchgear

THIS NEW BREAKER is internally mounted on the core and coil frame, providing easy accessibility through the handhole.

THE NEW L-M SECONDARY BREAKER, with trip-free control handle and signal light in a single unit, is completely operable with hook stick.

EMERGENCY CONTROL

FOUR POSITIONS ARE PROVIDED ON THE CONTROL HANDLE:

Position L—Light reset and/or test. This resets the light mechanism and simultaneously tests the bulb. Handle returns to Position "C" when the hook stick is removed. Thus the bulb and entire light circuit can be tested without risk of inadvertently opening the breaker and disconnecting the load.

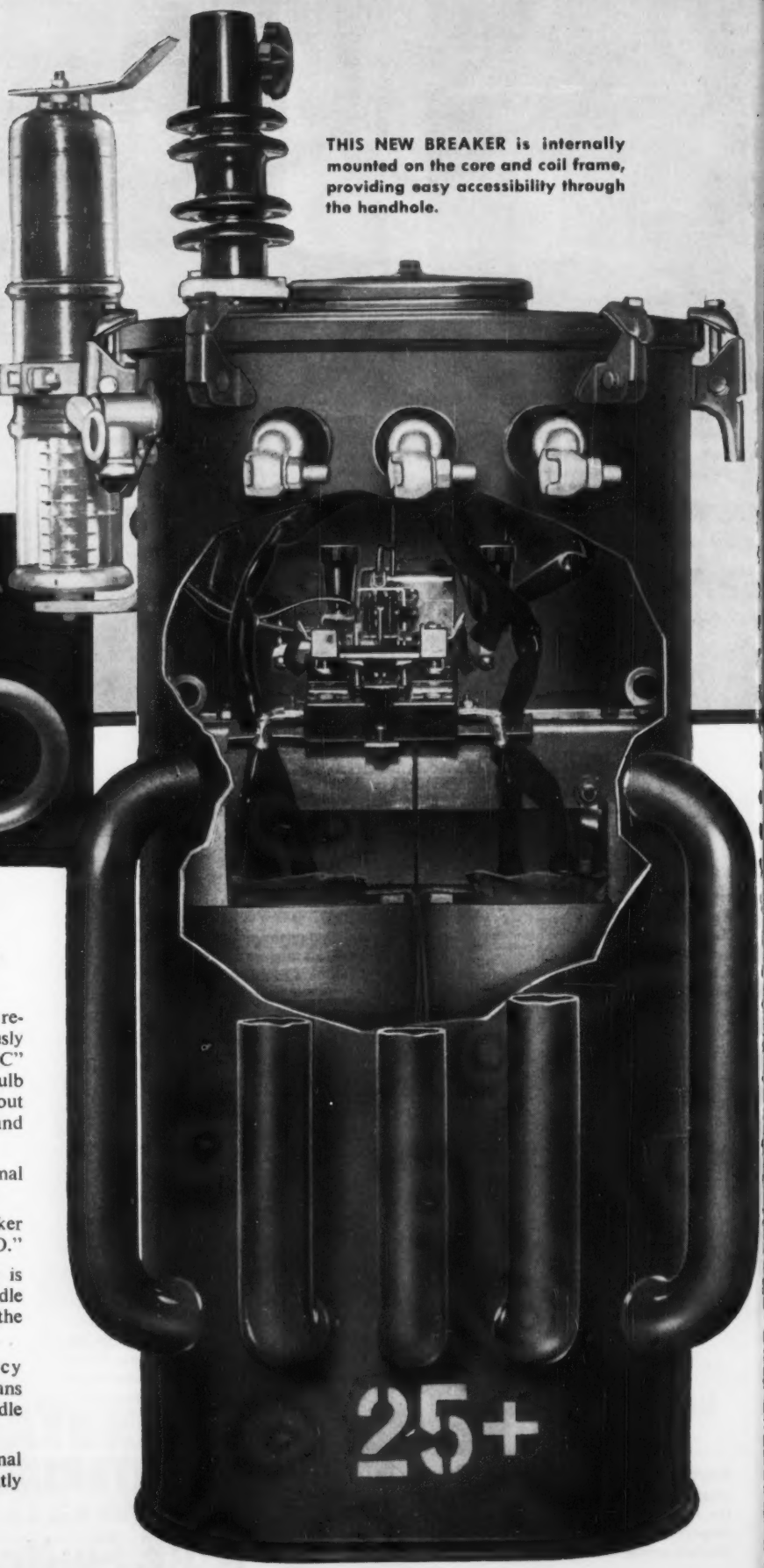
Position C—Close breaker. This is the normal operating position.

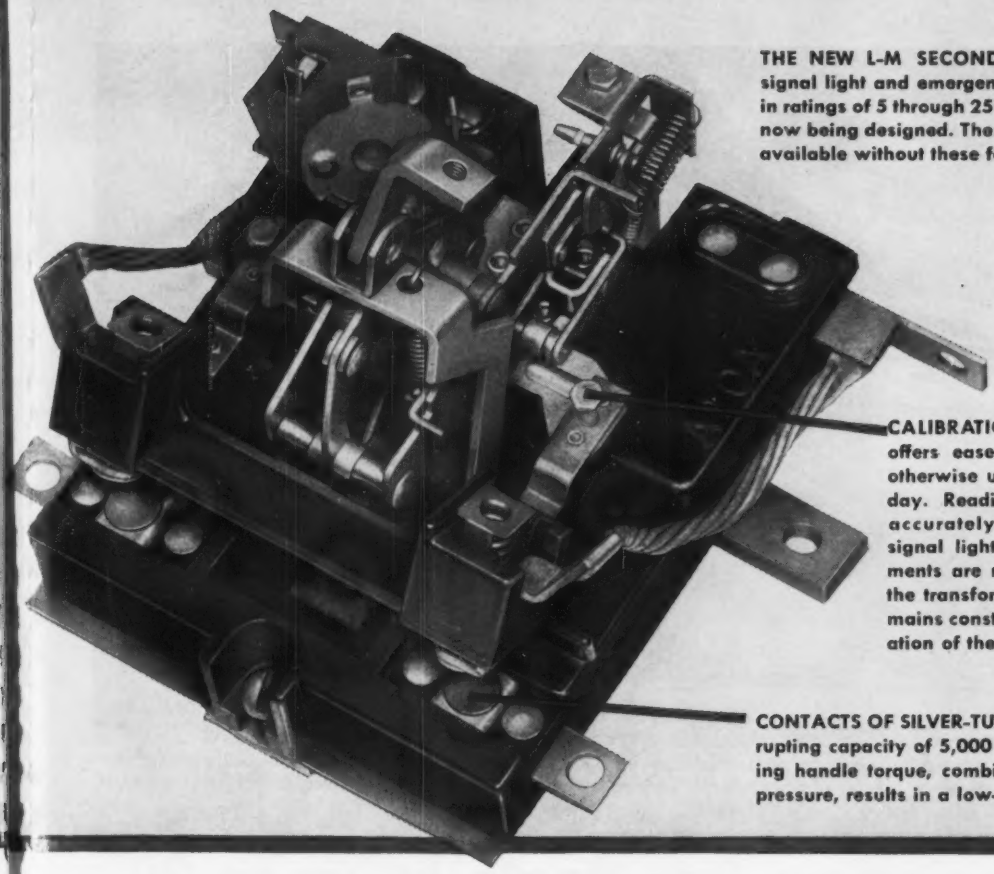
Position O—Open breaker. To open breaker manually, move the handle to Position "O."

Position R—Reset breaker. The breaker is manually reset by moving the control handle to Position "R." This motion precedes the closing operation to Position "C."

Emergency Control Handle—Emergency overload control can be accomplished by means of the emergency control handle. This handle is also hook-stick operated.

Signal Light—The brilliant glass-prism signal light is visible from the ground to slightly above horizontal.





THE NEW L-M SECONDARY BREAKER, with signal light and emergency control, is available in ratings of 5 through 25 kva, with larger ratings now being designed. The 3 and 5 kva ratings are available without these features.

CALIBRATION—This secondary breaker offers ease and accuracy of calibration otherwise unobtainable on the market today. Readily accessible adjusting screws accurately calibrate the overload and signal light settings. The bi-metallic elements are not mechanically connected to the transformer leads; thus calibration remains constant and is not affected by operation of the breaker.

CONTACTS OF SILVER-TUNGSTEN have an interrupting capacity of 5,000 amperes. Low operating handle torque, combined with high contact pressure, results in a low-resistance circuit.

New L-M Breaker Provides Complete Coordination for RWP® Transformers

New Kyle-designed breaker provides operating advantages for L-M Round-Wound-Protected Transformers

By **A. R. WAEHNER,**
Director Transformer Sales,
Line Material Industries

All RWP transformer components are now of L-M design and manufacture, affording a Round-Wound-Protected transformer coordinated for optimum performance. The L-M Type T-3 heavy-duty lightning arrester protects the primary winding against lightning.

Fuse links in the primary leads protect the system by removing the transformer from service in the event of internal transformer winding faults.

Round-Wound® design provides L-M exclusive continuous cruciform wound core with round coils of high impulse and short circuit strength.

Drawing upon Kyle's vast experience in arc-interrupting devices, L-M now provides a secondary breaker that supplements the other L-M manufactured RWP transformer components. With this new breaker, Line Material provides a self-protected transformer that is completely coordinated for optimum performance.

For additional information, contact your local L-M Field Engineer—or write me at Line Material Industries, Milwaukee 1, Wisconsin.

LINE MATERIAL® Industries
McGRAW-EDISON COMPANY
Distribution Transformers

McGRAW EDISON

401

DISTRIBUTION TRANSFORMERS • KYLE RECLOSERS AND OIL SWITCHES • FUSE CUTOUTS AND FUSE LINKS • LIGHTNING ARRESTERS • POWER SWITCHING EQUIPMENT
PACKAGED SUBSTATIONS • CAPACITORS • REGULATORS • OUTDOOR LIGHTING • LINE CONSTRUCTION MATERIALS • PORCELAIN INSULATORS • FIBRE PIPE AND CONDUIT

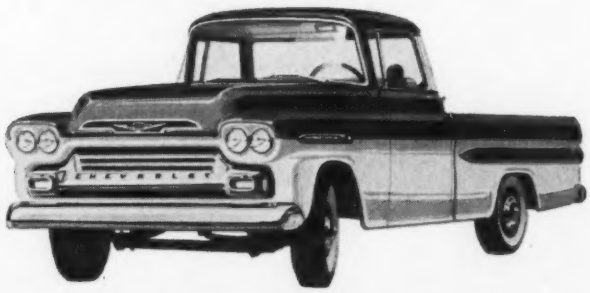
SEVEN HANDY STEPSIDE PICKUPS, typified by this Series 36 4-wheel-drive model, offer side running board, spacious bodies in 78", 98" and 108" lengths. The rugged go-anywhere *traction* of new Chevrolet 4-wheel drive is now available in both Fleetside and Stepside models.

Now . . . Slash Your Gas Costs by up to 20%

with a big, tough Chevy pickup!

Chevrolet's 1959 Thriftmaster 6, with new Economy-Contoured Camshaft, makes a tankful of gas go farther by many miles. It's standard in every pickup model . . . and so is extra load capacity and stay-on-the-job toughness!

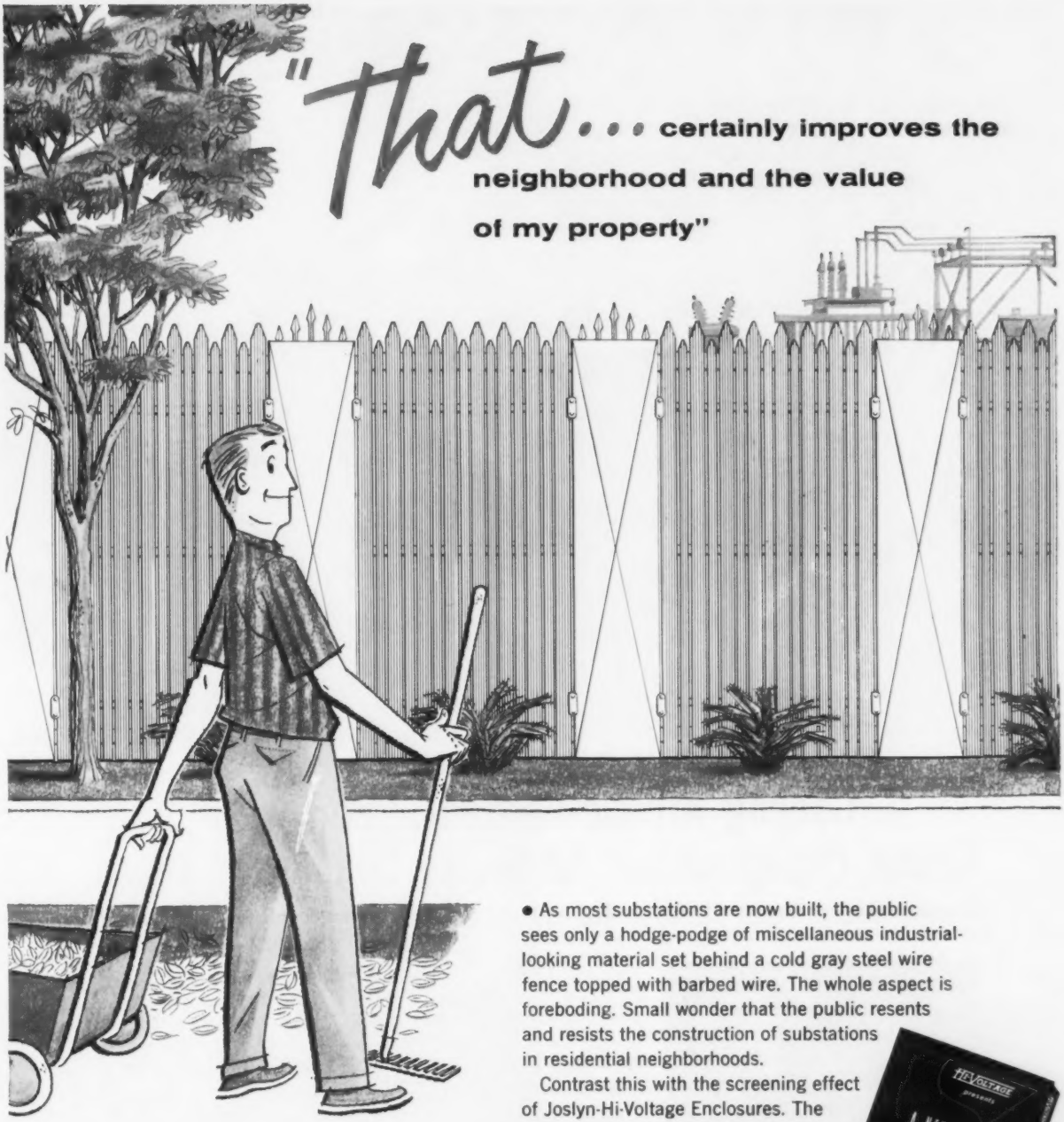
Choose any one of Chevy's 5 dashing Fleetside models or 7 handy Stepside models and you can count on extra savings right from the start. Each of these models offers the newly improved Thriftmaster 6 as standard equipment. With a new Economy-Contoured Camshaft, this engine provides up to *10% less fuel consumption.* And in conventional Series 31 and 32, the Thriftmaster can be equipped with a new Maximum Economy Option*, consisting of new smaller venturi carburetor and economy ratio rear axle, that improves economy by an additional 10%! Or, if you prefer V8's, these models (with the exception of 4-wheel drives) offer the power-packed performance and short-stroke efficiency of the advanced 160-h.p. Trademaster V8*. **Extra cost*



FIVE DASHING FLEETSIDE MODELS offer the prestige-building style of smooth-lined body side panels as well as extra carrying capacity. Bodies come in lengths of 78" or 98" and all are a full 6' wide! Maximum payload capacity is a high 2,750 lbs. Both Fleetside and Stepside models offer ruggedly built tight-fitting tailgate and long-lasting select-wood floor with steel skid strips.

Whatever you haul and wherever you haul it, you're sure to find a new answer to bigger loads and bigger savings in one of Chevy's spankin' new '59 pickups! See 'em at your Chevrolet dealer's now. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

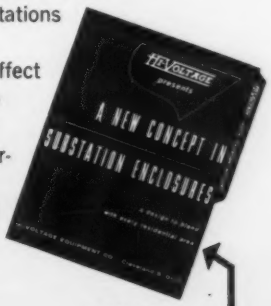
No job's too tough for a Chevrolet truck! CHEVROLET



"that... certainly improves the neighborhood and the value of my property"

• As most substations are now built, the public sees only a hodge-podge of miscellaneous industrial-looking material set behind a cold gray steel wire fence topped with barbed wire. The whole aspect is foreboding. Small wonder that the public resents and resists the construction of substations in residential neighborhoods.

Contrast this with the screening effect of Joslyn-Hi-Voltage Enclosures. The design can be varied to harmonize with the architecture of the neighborhood, and in a matter of hours, your substation can be transformed into a structure that complements and enhances civic values.



ASK FOR

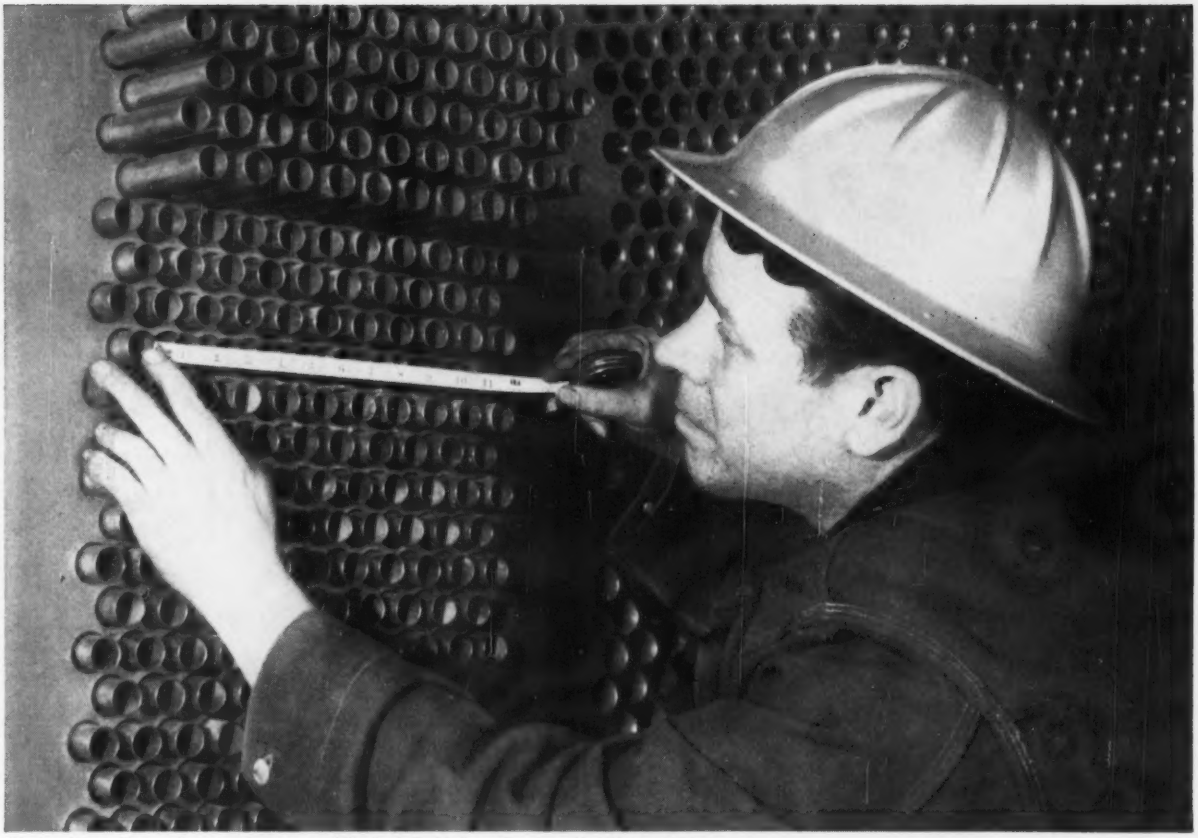
DECORATIVE PANELS
Tudor design shown above, others at left.

Ask your Joslyn representative for complete details about Hi-Voltage-Joslyn enclosures.

HI-VOLTAGE EQUIPMENT COMPANY

DIVISION OF JOSLYN MFG. & SUPPLY CO.

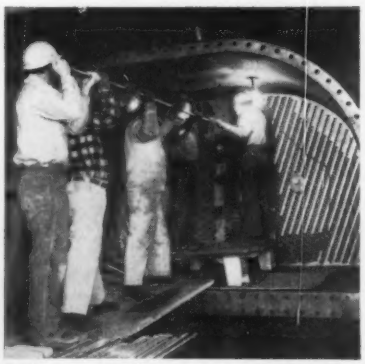
4000 EAST 116th STREET • CLEVELAND 5, OHIO



Worker inspecting and measuring some of the installed tubes after insertion in the condenser.

Cooling Atomic-Heated Steam with Chase® Phosphorized Admiralty Condenser Tubes

Dresden Nuclear Power Station to Add 180,000 KW to Commonwealth Edison Output



Part of the 16,700 condenser tubes now being installed at Dresden Nuclear Power Station, located near Morris, Illinois.

The new Dresden Nuclear Power Station of Commonwealth Edison will generate an additional 180,000 KW of electrical power for northern Illinois. The fission of uranium provides heat, boiling water up to 1,000 psi and 545°F. Steam reaching the condenser carries 1010 BTU/Lb and passes over the condenser tubes at a rate of about 25,500 Lbs/Min.

More than 70 tons of Chase phosphorized admiralty condenser tubes are used in the condenser whose job is to condense the steam in order that it can be recirculated in the system on a continuing cycle.

Whenever steam is condensed back to water you'll find a Chase® condenser tube that's ideal for the job. Your nearest Chase Office can give you specific help in selecting the alloy for best results...for either new or re-tubing jobs. Or write to Chase at Waterbury 20, Connecticut.

Chase BRASS & COPPER CO. WATERBURY 20, CONN.
Subsidiary of *Kennecott Copper Corporation*

THE NATION'S HEADQUARTERS FOR ALUMINUM • BRASS • BRONZE • COPPER • STAINLESS STEEL AND FORGINGS
Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L. I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

RT&E

engineering talent concentrated on transformer CORE development

provides

- **Lower Core Loss**
- **Uniform Performance Characteristics**
- **Quieter Operation**
- **Easier Repairability**
- **Lighter Weight**

The R T & E wound core represents the newest innovation in core construction in over 20 years. It is constructed of the finest grain-oriented steel available, formed into a compact core of single turn laminations with butted joints. It has set new standards for lower core losses, quietness of operation, uniformity of performance and easier repairability.

Two "J" bolts fasten the assembly securely to tank wall and exert a downward pull on the upper core clamp. The compressive force produced clamps the full-span coil blocks firmly against the coil sections for added short circuit strength.

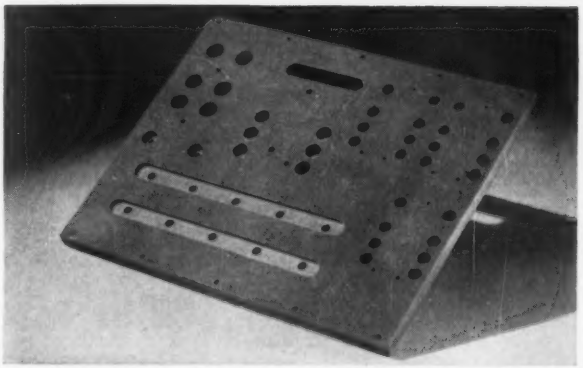
The unique R T & E method of fastening the core-coil assembly in the transformer tank eliminates the need for conventional side braces by utilizing the tank wall for this purpose. Elimination of these side braces exposes more coil surface to the oil, and provides an unobstructed path for oil circulation through the coil ventilating ducts.

ENGINEERING TALENT CONCENTRATED ON ONE IDEA — A BETTER TRANSFORMER

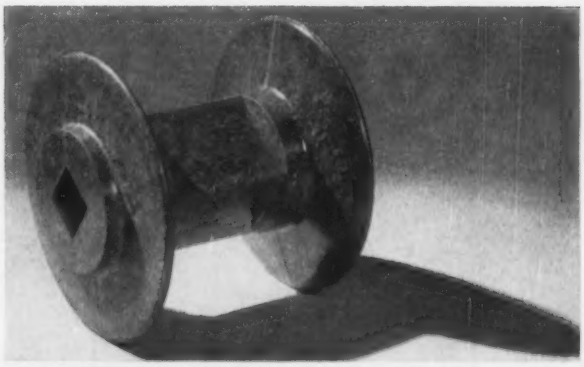
RT&E CORPORATION

WAUKESHA, WISCONSIN • PORTLAND, OREGON

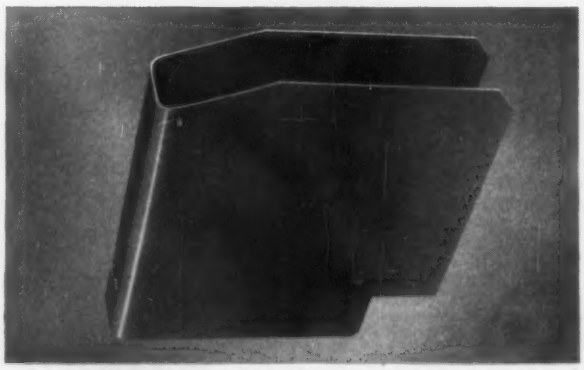
FOUR WAYS THAT MODERN POWER EQUIPMENT BENEFITS FROM CDF INSULATION KNOW-HOW



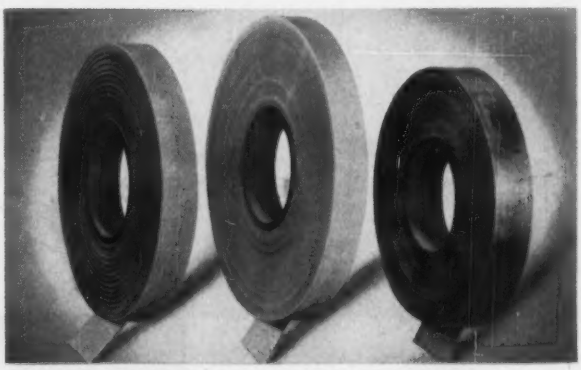
CDF **UNDERSTANDS THE ELECTRICAL INDUSTRY'S NEEDS.** Equipment designers can often save space with dependable CDF insulating parts, developed for each specific power application. This, for example, is a Dilecto® panel board.



CDF **OFFERS UNIQUE MATERIALS.** This contact shaft for an air circuit breaker is a typical example of CDF Celoron® used in switchgear because of its very high impact strength. Celoron is CDF's molded phenolic material, highly adaptable and rugged.



CDF **USES MODERN METHODS.** Large quantities of arc-chute barriers are made from paper-base, flame-retardant Dilecto laminates. Operations on these parts include pressing, cutting, post-forming, and trimming.



CDF **MAKES INSULATING TAPES** of DuPont TEFLON TFE fluorocarbon resin, both glass-supported and unsupported; also flexible tapes of silicone rubber and CDF Micabond® for high-heat applications.

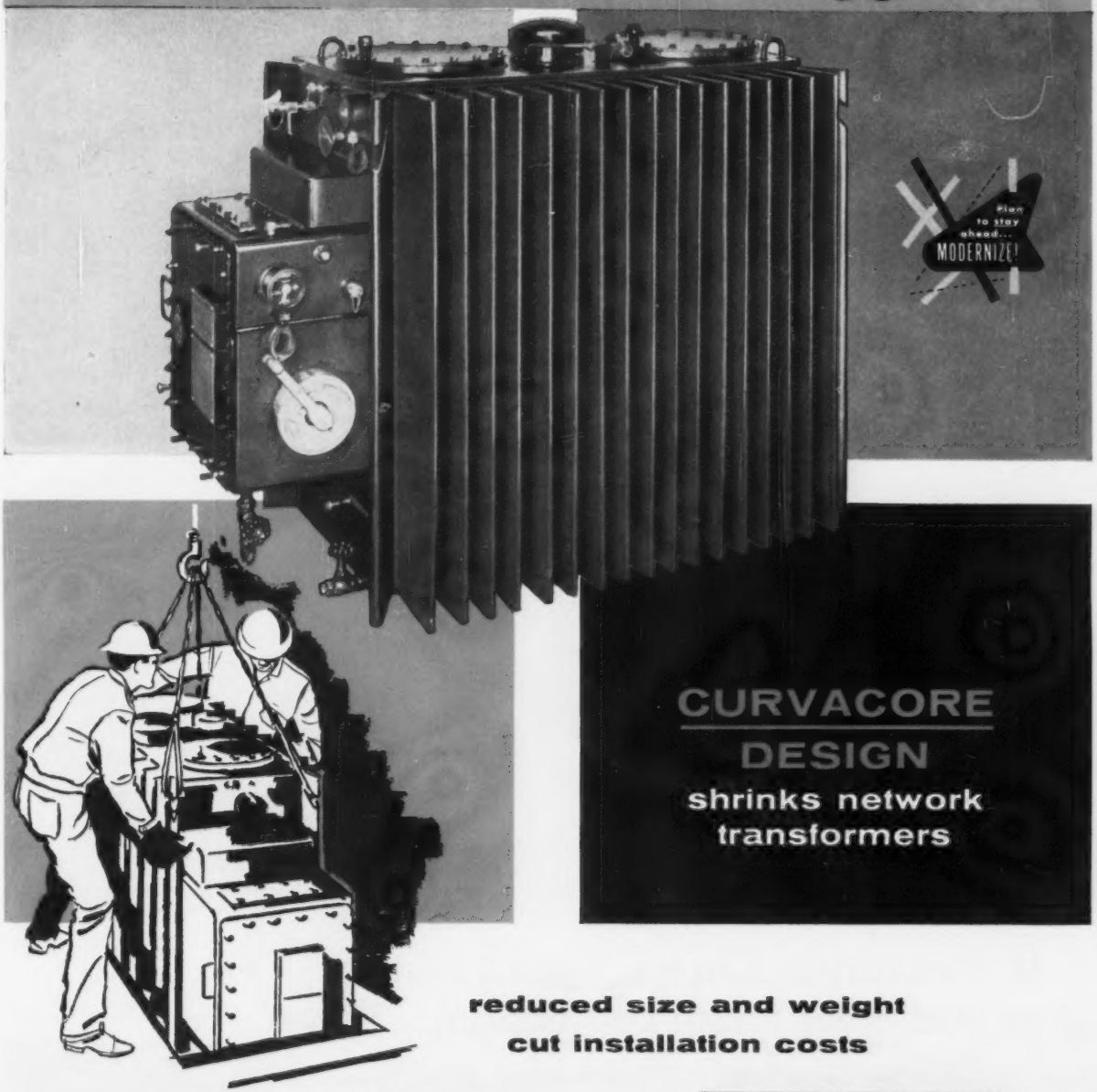
LOOK FOR CDF in Sweet's Product Design File. Send us your print or your problem, and we'll return recommendations for your particular needs.

CONTINENTAL-DIAMOND FIBRE

A SUBSIDIARY OF THE Budd COMPANY • NEWARK 15, DEL.

In Canada: 46 Hollinger Road, Toronto 16, Ont.

ALLIS-CHALMERS modern line for '59



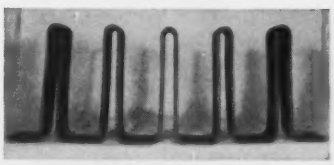
CURVACORE DESIGN shrinks network transformers

reduced size and weight cut installation costs

Smaller vault requirements per kva! That's the big economy advantage of the new Allis-Chalmers network transformer. Sizable savings in excavation and construction costs take much of the sting out of high labor rates. With a smaller, lighter transformer to handle, work crew efficiency is improved in installation. And, of course, increased kva may be installed in existing vaults where system growth requires it.

Utilities gain, too, in improved performance. Use of quality controlled *Curvacore* construction and advanced design techniques assure greater efficiency ... lower exciting current and lower losses.

For detailed information on this compact transformer, call your local Allis-Chalmers representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



Corrugated tank slashes maintenance

All cooling surfaces are accessible for repainting by brush, spray or flow. Simplified preventive maintenance reduces chance of corrosion damage. Tank retains its original high strength.

Curvacore is an Allis-Chalmers trademark.

A-5939-E

ALLIS-CHALMERS

Along today's modern highways easy-to-handle J-M Transite Ducts provide installation economies and years of service life, protecting traffic-signal, lighting, and other power-service circuits.

J-M Transite® Ducts install fast to last... give complete cable protection.

Because speed and economy set the pace in today's highway programs, more and more highway cables are going into Johns-Manville Transite Ducts.

For speed, Johns-Manville Transite Ducts are strong, light and long—easy to handle and install. Workmen set 10-foot lengths in place easily, join them up tight in seconds with snug-fitting J-M Plastic Couplings, and Transite's smooth bore is free of burrs and other obstructions that may interfere or cause damage during pulling of cables.

For economy, J-M asbestos-cement Transite Ducts go in to stay. Non-conductive Transite is not affected by electrolysis—resists the corrosive action of fills or high-salt soils in permanently damp locations. Millions of feet of installed Transite Ducts have proved that Transite withstands earth loads and soil stress... resists vibration and shock from highway traffic.

Let us send you free Transite Duct brochure EL-29A. Write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville Asbestos Transite Ducts can be laid directly in trench without concrete envelope or other mechanical protection.

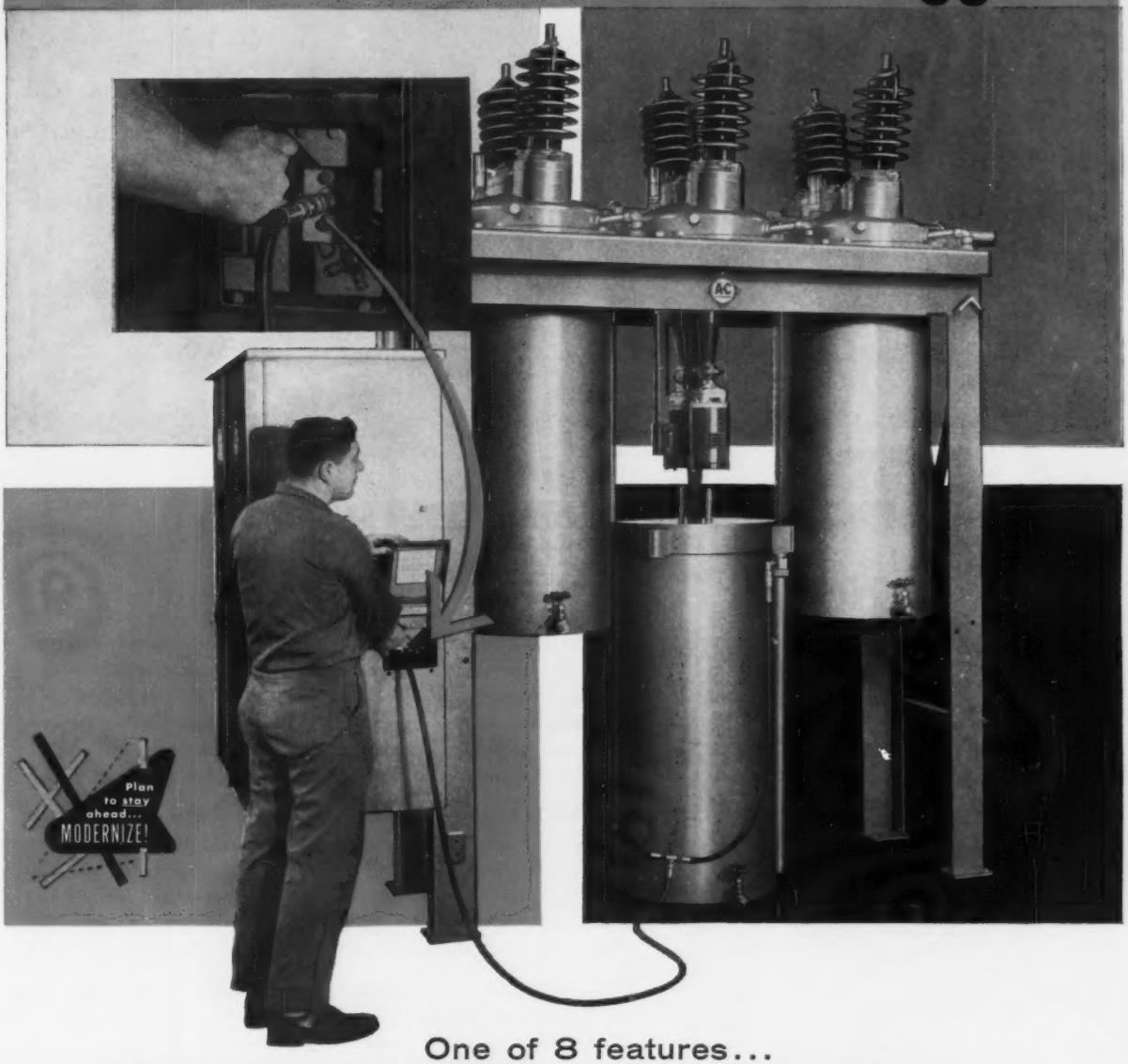
JOHNS-MANVILLE Transite Ducts

Made of Asbestos-Cement

J-M Conduit for direct buried banks and exposed runs

J-M Korduct® for concrete banks

ALLIS-CHALMERS modern line for '59



One of 8 features...

light, fast-acting hydraulic tank lifter

LIFTING and lowering tanks is a one-man job with light, easy-to-handle, easy-to-operate A-C tank lifters. No cables, no pulleys . . . can even be operated manually with *Pneu-Draulic* operator hand pump if control power is not available. Compared with old methods of raising and lowering tanks — takes 80% less time.

Operating Advantages

But this is only one of many outstanding operating advantages of Allis-Chalmers large frame-mounted breakers.

Standard A-C features include:

New 5-cycle interrupting devices
Reliable, fast-acting *Pneu-Draulic* operator
Mechanically and electrically trip-free
Float-type oil gauge
Position indicator
External adjustment of overtravel stop
Single lift-rod guide for accessibility

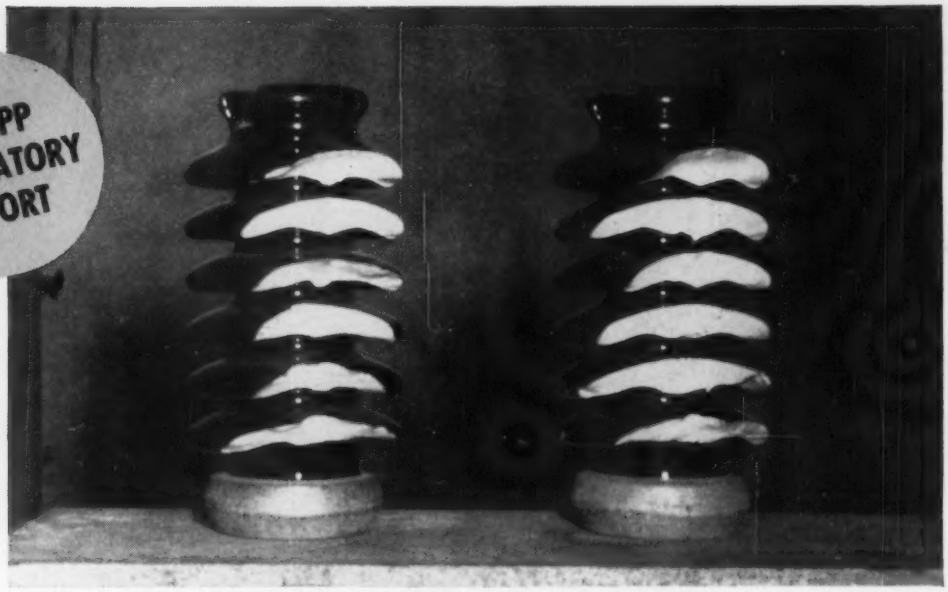
Write for Bulletin 71B8475. Contact your nearby A-C office or Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

Pneu-Draulic is an Allis-Chalmers trademark.

ALLIS-CHALMERS

A-5958-E

A LAPP LABORATORY REPORT



BROKEN CORRUGATIONS...

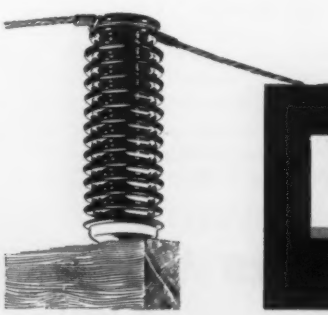
how do they affect performance?

THE PROBLEM: It is well known that mechanical damage to the Lapp Line Post insulator causes much less loss of its electrical characteristics than does such damage to pin-type or suspension insulators. Good maintenance on a system generally does call, however, for changing out insulators that show sign of damage. How urgent is it to replace insulators reported as being damaged? The answer, of course, involves security of the system as well as economy of maintenance, and can be found only in evaluation of characteristics.

THE TEST: Utility engineers whose company operates a large system on Lapp Line Posts wished to set a standard procedure for Line Post maintenance. They visited the Lapp plant and had us make laboratory tests of 35 kv Lapp Line Posts, measuring dry and wet flashover value with petticoats progressively broken off. (We used a hammer to simulate mechanical damage in the field.)

THE FINDING: With the top petticoat broken off, dry flashover was reduced less than 1%, wet flashover by slightly less than 4%. With all six petticoats gone (as shown in the photo) flashover tests showed a loss of 7% in both dry and wet 60-cycle flashover. (In a similar test made previously, we found loss of all corrugations reducing wet flashover somewhat more—apparently the exact pattern of the break has an important effect.)

THE CONCLUSION: The strong post body of the Lapp Line Post remains intact, and an insulator with all petticoats broken will handle normal operating conditions. Loss of one or two corrugations poses no urgency whatsoever. The company for whom this test was made will replace insulators so damaged only when convenient.



Lapp

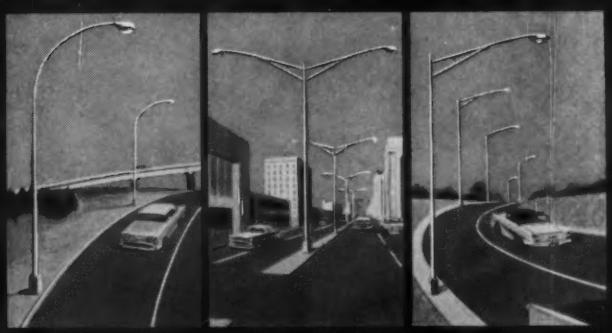
THE MORAL: Use Lapp Line Posts on your system for distribution and subtransmission up to 88 kv. They'll give you an extra margin of operating security, low maintenance cost and long life.

Lapp Insulator Co., Inc., LeRoy, N. Y.

GLIMPSE OF TOMORROW IN A GROWING AMERICA

Dynamic Philadelphia . . .

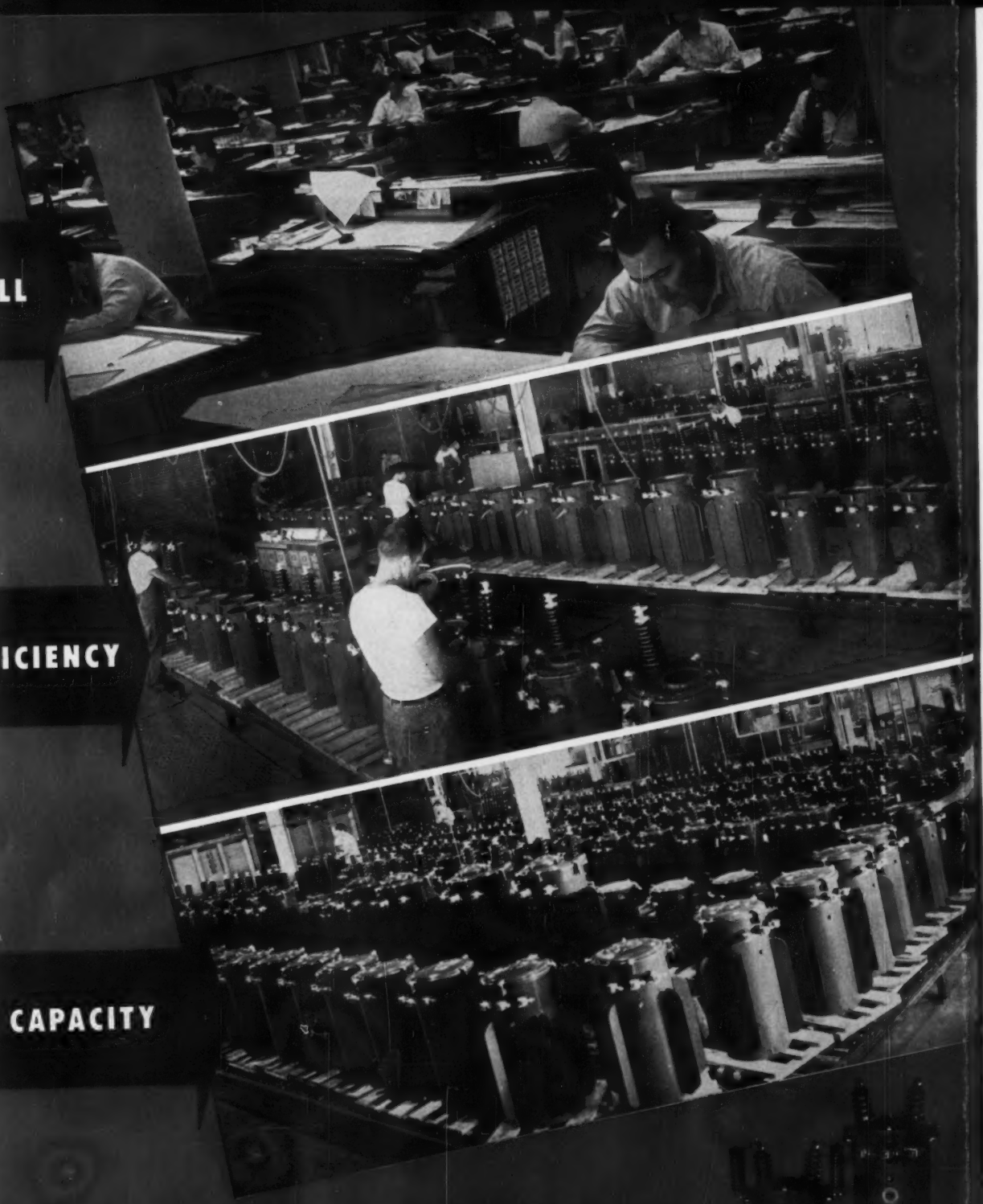
builds for tomorrow today.
Beautiful new buildings, expressways designed for future traffic, restful parks and modern parking facilities . . . all part of a building renaissance sweeping Philadelphia . . . and all America.



Contributing to a vast national redevelopment program . . .

The New Standard in Aluminum Lighting Standards . . . by READCO

READ STANDARD, YORK, PA. • A DIVISION OF CAPITOL PRODUCTS CORPORATION



Provide Moloney Distribution Transformers in the Quantities You Require

Modern, highly mechanized production methods give Moloney the ability to provide any quantity of transformers needed to fulfill your requirements.

These efficient production methods, together with skillful design and [illegible] quality control procedures, guarantee that Moloney Transformers will be of the highest quality.

Specify the transformers that are designed, built and tested for efficient, dependable performance under all operating conditions. Specify Moloney Transformers . . . All Along the Line.

MOLONEY ELECTRIC COMPANY

MOLONEY ELECTRIC

Annual Reports Are Being Improved

Annual reports of electric companies for 1958 show improvement in both content and presentation on the average.

On the whole, the companies with consistently good reports have not changed materially. But they do continue to show improvement. This is especially true of reports of Philadelphia Electric Co, American Electric Power, Central South West Corp, Atlantic City Electric, and numerous others. Some have obviously become less flamboyant without loss of effectiveness. Pennsylvania Power & Light Co is a good example.

Arizona Public Service Co has moved toward an entirely new type of presentation using a magazine format. This report has many good features. Rochester Gas & Electric Co carried an outstanding special section on the political front.

The important point is that the average report has improved substantially. Concise writing, helpful information, good charts and illustrations, and thoughtful choice of content are typical characteristics of a majority of reports.

On the negative side, one area stands out. Most companies say too little about the future. Information on expansion plans, area development, sales programs, etc., is far too sketchy.

But overall, we see that annual reports are being improved at a good rate. We think this is a highly constructive trend. For winners in the Reddy Kilowatt annual report contest turn to page 42.

Sales Programs Must Be Stepped Up

With the ever increasing gas competition, and alert merchandising on the part of gas companies, electric utilities should take a close look at their sales promotion programs.

Are you getting full effectiveness from your program? Is the money you are spending going into the right areas? Are you spending enough money?

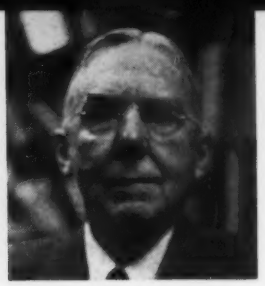
In these times of rising prices and the need for raising rates, this last one might seem like a rough question. But prior to World War II the industry was spending about 3% of its gross revenue on sales promotion expense. In 1948, sales promotion expense of electric companies was only 1.6¢ of each dollar of revenue. In 1957, nine years later, it was still 1.6¢.

And yet there is a larger area now for promotion expense, both nationally and locally. EEI's National Electric Living Program, though only four months old, is planning ahead for next year and even now is on a fund-raising drive. Utility support has been good, but it is far from complete. As the program grows in size even more support is going to be needed. The Gold Medallion Home Program is still in need of the industry's continued support. And there also remains the sales task of improving the kwhr use of 37 million existing homes.

Sales promotion expenses may have to be increased if the industry is to obtain the maximum customer utilization of, and satisfaction with, the volume of service he will be receiving. Informed and satisfied customers are your wisest and soundest investment for future growth.

We urge utilities to take a careful, searching look at sales promotion programs. This is the time for renewed, all-out promotion, not a tightening of the belt. We are sure the results will make the expenditure, both in time and money, well worthwhile.

BURTON

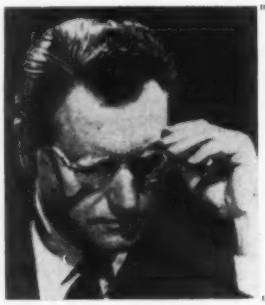


BONBRIGHT

CRAWFORD

Rockefeller Names Task Force for

Group will look at hydro, steam, A-power, transmission, and will 'work closely with Power Authority and PSC.' Closer integration of public, private sources hinted



ROCKEFELLER:
"An adequate supply of power is one of the key factors for the economic growth of our state.... How can we best encourage and promote the increase in production of the power we need at realistic costs for our state's economic growth? . . . I have appointed a seven-member task force to study the state's power needs and resources, looking ahead to at least the next ten years."

The announcement by Gov Nelson Rockefeller of New York of the formation of a seven-man task force to survey the state's future power needs has touched off a flurry of speculation.

The consensus of interested observers suggests that the study may have far-reaching implications—for New York State utilities and for the entire power industry.

It is believed that the task force will go into hydro, conventional steam, and nuclear generation; will also delve into transmission and distribution, rates and regulation; and, for purposes of comparison, will not confine itself to the limits of New York State.

Rockefeller announced the creation of the task force June 2 in a speech before the Niagara County Republican Committee at Niagara Falls, N. Y.

He said: "An adequate supply of power is one of the key factors for the economic growth of our state. It is important therefore that we have an informed appraisal of our present power needs and capacity, our likely future power demands and the potentialities for supplying them.

. . . I have appointed a seven-member task force to study the state's power needs and resources looking ahead to at least the next ten years."

To head the group, Rockefeller chose John Burton, vice president for administration of Cornell University and a former chairman of the New York Power Authority.

Other members: Dr James C. Bonbright, professor of public utility economics at Columbia University; Dr Finla G. Crawford, vice chancellor of Syracuse University and now a member of the Power Authority; Charles Eble, president of Consolidated Edison Co; Robert I. Ginna, board chairman of Rochester Gas & Electric Corp; Earle J. Machold, president of Niagara Mohawk Power Corp; and Harry Van Arsdale, president of Local 3, International Brotherhood of Electrical Workers and chairman of the New York City Council, AFL-CIO.

The task force will meet June 22 in New York City, and "at least once a month" thereafter, according to Chairman Burton. The group will maintain its headquarters and a "small but expert" staff in New York City. Its report will be in the governor's hands in about six months.

Just how far the report would go remained unclear, but Rockefeller supplied a rough outline in his Niagara Falls speech, and several sources speculated on details.

Said Rockefeller: "I have asked this task force of men who know the power business to address themselves realistically to the people of this state and to consider such matters as the following:

"How can we best encourage and promote the increase in production of the power we need at realistic costs for our state's economic growth?

"What is our state's feasible remaining undeveloped hydro-electric power potential?

"What is the present availability and what are the likely supply trends in other sources of energy for New York—nuclear, thermal, gas, coal?

"How can we assure the most effective distribution of power to meet our future needs?

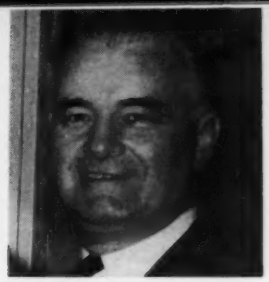
"What are the future power costs likely to be for our state and how will they compare with the rest of the country?"

Sources speculated that this implies an all-out campaign by New York State to meet the competition

EBLE

GINNA

MACHOLD



VAN ARSDALE

'Broad' Study of N.Y. Power Needs

for new industry that has been coming from all over the U. S.—including the TVA area and the Pacific Northwest.

The study might, some sources said, be aimed at determining the most economical integration of public and private power in the future. One observer rephrased Rockefeller's question: "In order to keep pace with TVA, must New York go public?."

All means of generation will apparently be studied, including nuclear, in order to predict New York's power sources at least ten years ahead and to estimate their costs. Interested observers reflected that this might be done by gathering together data from New York's power companies, since their planning already extends far ahead.

Transmission cannot be excluded from the study, it was supposed, and system integration will probably be a part of it, sources said.

A spokesman from Gov Rockefeller's office said that the study would include "all phases of power development." He added that a program for development of needed electric power by whatever means available to meet growing needs systematically will in itself help the economic prosperity of the state.

Only members of the committee itself who could be reached for comment were Machold and Chairman Burton. Both said that they anticipated no "public vs private" feuds.

Burton read a prepared statement on behalf of the members of the task force. It said in part: ". . . We enjoy a significant area of agreement upon special studies to be undertaken to clarify problems pertinent to the expansion of electric power resources suited to a strengthened state economy. From the breadth of interest and experience of our membership, we are intrigued by the opportunity to translate this preliminary agreement into sound courses that the state can follow in gaining expanded electric power resources."

Burton said the task force would work closely with the New York Power Authority and the Public Service Commission.

Robert Moses, chairman of the Power Authority, did not offer an opinion on the purposes or makeup of the committee. He said that he had made no recommendations on the committee's makeup.

Sources drew the inference from Burton's statement of close work with the PSC that regulation might also enter the task force's agenda. This could take the form of an investigation into current regulatory practices, and their effect on utility economics.

Two aspects of this study might be integration across state lines and joint ownership of large power plants for reasons of economy.

Studies generally similar to the New York survey have recently been initiated in Vermont, Kansas, and on the West Coast.

Power Bills Leave Committees

AEC Authorization, Public Works Appropriations Bills show Administration's influence. Early vote seen for both bills

Two major pieces of legislation, the Public Works Appropriations Bill and the AEC Authorization Bill, are moving steadily through the Democratic-controlled Congress. Their progress shows clearly the pressure from the Eisenhower Administration.

• The Public Works Appropriation Bill for fiscal year 1960, just reported from the House Appropriations Committee, has been held to the precise total figure—$1,185,406,259—requested by the White House. However, the figures within this total have been juggled deftly to add 38 new construction starts—none for power—and continuing funds for other projects under construction or study have been cut.

The Little Goose Power Project on the Snake River, Wash., was given $450,000 for initial planning by the army engineers—the only "new planning start" for a federal power project. Other federal power projects which were given additional study funds in the 1960 appropriations bill are: Lower Monumental on the Snake River, Wash. ($800,000); Bruce's Eddy on the North Clearwater River, Idaho ($770,000); Potomac River review above Washington, D. C. ($400,000).

But the committee knocked out the Interior Department's request for $200,000 for planning at the proposed high Pleasant Valley site, and it also knocked out an addi-

(*Continued on page* 42)

Public Works, AEC Bills

(*Continued from page* 41)

tional request of $500,000 for planning at the Burns Creek project.

Also missing was Trinity River Project. Since the California legislature recently voted (43 to 25) against Pacific Gas & Electric Co's "partnership" proposal, this leaves Trinity stalemated for the present.

Federal power agencies were given the following sums in the committee's 1960 money bill: $32,582,000 for Bonneville Power Administration (up $2.1 million from fiscal 1959); $15,286,000 for TVA (down $1.5 million); $2,030,000 for Southwestern Power Administration (up $900,000); $735,000 for Southeastern Power Administration (same as in 1959).

Major appropriations for projects under construction included: $47,367,000 for Glen Canyon, $43.5 million for Oahe, $32 million for Ice Harbor, $20 million for John Day, $13.4 million for Eufala, $13 million for Flaming Gorge and $12.5 million for Oolagah.

AEC Program Not 'Ambitious'

• Congress is set to vote for an atomic energy program that, while a little fatter than the Administration wants, is a far cry from the "ambitious" program expected in the wake of the November elections.

The 1960 authorization bill reported out by the Joint Committee on Atomic Energy would authorize a total of $165.4 million in new plant acquisitions and construction by the Atomic Energy Commission for both military and civil projects. Although representing a boost of $50 million over the Administration's request, this is less than half the figure authorized last year.

Nine Reactors Authorized

Nine civilian reactors are authorized for construction by the government, or with its help, plus alterations to increase the capacity of the reactor at Shippingport, Pa., to 150,000 kw.

Projects added by the Democratic-run joint committee include an $18.5-million natural circulation prototype reactor for naval propulsion, an $11-million civilian reactor capable of using nuclear superheat and $4-million for new research facilities at Lawrence Radiation Laboratory, Calif., and at the Oak Ridge National Laboratory, Tenn.

The committee decided against inclusion of authority—recommended by the AEC and backed by some powerful figures within the committee—to encourage commercial reactor construction through a capital grant system.

No trouble is expected in obtaining the necessary appropriations for the program. President Eisenhower's proposal for a $100-million linear accelerator at Stanford University will be handled separately.

Commonwealth Ed to Try All-Aluminum Towers

Commonwealth Edison Co this summer will build an experimental transmission line six miles long using all aluminum towers. Purpose is to compare relative costs of purchasing, erecting, and maintaining aluminum vs. steel towers, Edison says.

Strength testing of the aluminum towers has already been completed successfully.

A total of 44 towers will be erected as a section of a 138-kv line between Edison's Will County generating plant and its McCook substation, southwest of Chicago. Aluminum Co of America is furnishing the towers.

Most important savings that could stem from aluminum tower line construction are in erection, owing to lighter weight, and maintenance, owing to reduced costs of periodic repainting of the conventional steel type of towers.

Measurement of erection costs will be accomplished this year, but the final comparison of maintenance costs "may take years," according to Commonwealth Edison. "The aluminum towers will not be painted, but it will take time to determine how well they will withstand the corrosive effects of an industrial atmosphere," according to the company.

Arizona PS, Philadephia Electric Share Top Report Award

Arizona Public Service Co and Philadelphia Electric Co share top honors in the 1959 Reddy Kilowatt Annual Report Contest, it was announced last week.

Judges gave two top awards this year "because the two reports were outstanding in every respect but achieved their objectives by different characteristics and format."

The Philadelphia report was an example of the traditional format, "concise and dignified . . . anything but stuffy," according to the judges. The Arizona PS report used a new magazine format, fold-out statistical summary, and other innovations.

Other winners are as follows:

Class A: First—Consumers Power Co; Honorable mention—Georgia Power Co, Northern States Power Co.

Class B: First—Northern Indiana Public Service Co; Honorable mention—Central Power & Light Co, Puget Sound Power & Light Co.

Class C: First—Rochester Gas & Electric Corp; Honorable mention—Southwestern Public Service Co, Hawaiian Electric Co, Wisconsin Power & Light Co.

Class D: First—Iowa Southern Utilities Co; Honorable mention—Southern Nevada Power Co, Montana-Dakota Utilities Co.

Holding companies: First—Middle South Utilities Co; Honorable mention—Central & South West Corp, American Electric Power Co.

Foreign companies: First—Shawinigan Water & Power Co, Montreal; Honorable mention—Quebec Power Co, Quebec, and Mexican Light & Power Co, Mexico City.

A "substantial" overall improvement in the reports was noted by the judges of the contest.

Judges were: J. C. Bevis, president, Opinion Research Corp; Fischer S. Black, publisher and editor, Electrical World; J. F. Childs, vice president, Irving Trust Co; and F. W. Page, president, Tri-Continental Financial Corp.

Supreme Court Sends Piqua Hassle Back to State

Another chapter in the 26-year old legal fuss between the city of Piqua, Ohio, and Dayton Power & Light Co over removal of the utility's poles and wires from city streets ended June 1 in the U. S. Supreme Court.

In a brief order, with no written opinion setting out its reasons, the Supreme Court granted review of the case and reversed the Sixth Circuit Court of Appeals' ruling in favor of the power company.

The long battle began in state courts in 1933. Later, the power company took the case to the federal courts—on grounds that the holder of its mortgage was not a citizen of the state of Ohio.

In its brief asking the Supreme Court to review the court of appeals ruling, Piqua said removal of the suit from state to federal courts was "invalid" since both the city and the utility were residents of Ohio.

Supreme Court Upholds City

The court of appeals held Piqua had no contract with DP&L and needed approval of the Ohio Public Utility Commission to oust the utility. The Supreme Court, in effect, upholds the city argument that it had the right to force DP&L to stop using city streets to distribute power after it terminated the utility's franchise.

The company's poles and wires were placed on city streets under a city ordinance adopted in 1884. The action to force DP&L out of town was authorized by the city council when the city started up its own plant in 1933. The city-owned plant now supplies more than 90% of the service in Piqua; Dayton Power & Light furnishes the rest.

The company maintains, however, that this is not the final chapter in the story. The case will now go back to the state courts.

Morse, Neuberger Oppose Nez Perce, Potomac Dams

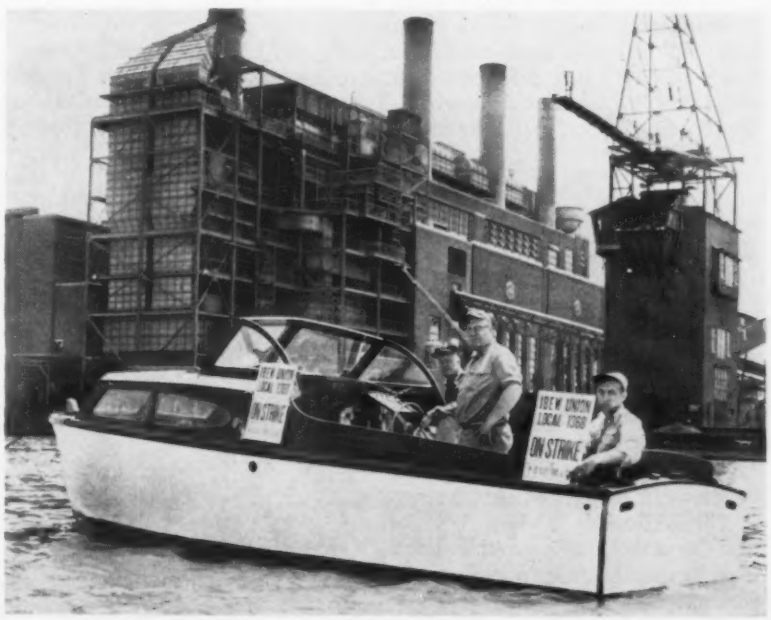
Both Democratic senators from Oregon went on record recently in opposition to federal power dams.

Sen Richard Neuberger repeated his stand against a high Nez Perce Dam in a letter to an Oregon labor group. The Nez Perce site is just below the confluence of the Salmon and Snake Rivers between Idaho and Oregon. It would also back water up the Imnaha River.

Said Neuberger: "It seems to me far wiser than urging authorization of the Nez Perce Dam for all of us to work hard for adequate federal funds for fisheries research so that learned men can apply their skill and knowledge to the question of safe passage for salmon."

Sen Wayne Morse spoke out against a proposed dam at River Bend on the Potomac, advocated by the National Rural Electric Cooperatives Association, which would provide an estimated 700,000 kw for preference customers around Washington, D. C.

"I have never favored discriminatory legislation which would seek to put private power operations out of business," said Morse. ". . . I do not favor construction of the dam if it is true that at the present time there is in this area adequate power for both its present and future needs."



Strike Continues at Public Service E&G

Striking members of International Brotherhood of Electrical Workers take to the water to picket Public Service Electric & Gas Co's Burlington Station on the Delaware River in Southern New Jersey.

As EW went to press, a speedy end to the month-old walkout seemed unlikely, with no meeting scheduled between company and union. IBEW is asking 6% wage boost, plus fringe benefits; while PSE&G maintains its 4.97% package offer, including a 4.78% wage increase, the company said.

Seventy of the 5,400 striking IBEW members have been suspended for illegal strike activity. This means they will not report back to work until their cases have been heard through regular grievance procedure.

Office employees (non-IBEW) returned to work after refusing to cross picket lines for one week. Supervisors are maintaining service.

Ebasco Questions FPC Accounting Revisions

Today (June 15) is the deadline for comments by utilities on the Federal Power Commission's proposed revisions of the uniform system of accounts. Ebasco Services Inc reported last week that it was not known what action had been taken by the utilities. However, Ebasco made public its own comments on the proposed revisions.

First, the consulting firm feels that the proposed effective date, Jan. 1, 1960, is unrealistically short notice for the change. Second, Ebasco feels, the revision fails to accomplish its purpose: the simplification of utility accounts. "Never," said the Ebasco statement, "was so much changed in so many places to benefit so few."

Some of the specific changes and Ebasco's comments are shown below:

Balance sheet accounts would be rearranged. Reserve accounts such as depreciation and uncollectibles would be shown on the asset side, netted against corresponding assets. Ebasco notes: "This might be considered as a trend toward consolidating those regulatory views which favor the so-called 'net plant' rate base."

Proprietary capital would include capital accounts plus capital and earned surplus accounts and capital stock expense. But deferred credit accounts are provided for "Accumulated Deferred Taxes" (liberalized depreciation, accelerated amortization, etc.), leaving them unrelated to equity. Ebasco says this may conflict with many state commissions.

Plant accounts are not much changed. However, one proposed instruction requires the so-called continuing property record, which many utilities do not now have. Also, provision has been made for nuclear generating plant.

In the income account, separate controls will be prescribed for "Operation Expense" and "Maintenance Expense." Although the definition of depreciation is unchanged, utilities would have to keep records of property and property retirements to reflect service life, mortality, and turnover. Interest during construction appears to be the same, despite a change in wording.

Operating revenues will be about the same, but more supporting detail is required in some cases.

Operation and maintenance expense accounts have been revised so extensively that, Ebasco notes, "comparability with prior periods will be difficult, if not impossible, to achieve."

Since many of these accounts have been "telescoped," Ebasco notes that some companies may wish to subdivide them to preserve useful data. "In any event," Ebasco says, "the changes are so broad as to require considerable study, adaptation, interpretation, and reeducation of field and office personnel to put them into practice."

Powerscope

Sudden Death for Ad Bill

A California legislative committee made short work of a bill to require the PUC to exclude advertising costs from a utility's operating expenses in fixing rates or charges.

The Assembly Public Utilities and Corporations Committee didn't even bother to hear opposition to the bill before they killed it.

The bill had been aimed at Pacific Gas & Electric Co's use of pamphlets and ads in favor of "partnership" development of Trinity River power. Both gas and electric utilities had been contacting legislators, pointing out the injustice of the bill.

Yucca No. 1 on Line

First 80-Mw unit of the jointly-owned Yucca Power Plant, near Yuma, Ariz., is now on line. California Electric Power Co owns, and Arizona Public Service Co operates the unit. PS will own the second unit of the outdoor-design plant, tentatively scheduled for completion in 1962.

Imperial Irrigation District is participating in the power pool. Purpose of joint ownership and pooling is to cash in on savings afforded by a larger plant.

AEC Signs with Piqua

AEC has signed contracts with the city of Piqua, Ohio, and Atomics International, a division of North American Aviation, Inc, for a nuclear power plant under the Power Demonstration Reactor Program.

Piqua will provide the site and a conventional turbine-generator, and will operate the plant for five years, buying steam from the government. Atomics International will build the reactor and fabricate fuel. Government will keep title to reactor and fuel.

It is expected that the reactor will be completed and tested by October 1961. Total estimated cost to AEC is $14.1 million, of which about $1 million will go to Piqua for costs above conventional operating costs.

'Windfalls' Will Cut Rates

Kansas utilities are not entitled to "windfalls" such as tax savings on liberalized depreciation, according to Marion Beatty, chairman of the state's Corporation Commission. Beatty announced that if a utility receives such savings, the KCC will move to have its rates reduced.

"It is very proper for a utility to be alert to reduction of expenses, including taxes," he said, "but any recurring savings must go to the ratepayer."

State Ok's Municipals

A bill to permit any municipality in Rhode Island to operate its own generating and distribution system has passed the House and gone to the Senate.

Rep J. F. Doris, sponsor, says if towns could operate their own systems they would not need so much financial aid from the state.

Superheat Loop Aids Nuclear Program

R. T. PENNINGTON, Specialist, Superheat Development, Atomic Power Equipment Department, General Electric Co, San Jose, Cal.

Superheated steam has been cited as an important goal for nuclear power to improve plant efficiency and bring reductions in power cost. But steam cannot be superheated in simple pressurized or boiling-water reactor systems, because the addition of heat simply generates more saturated steam. The saturated steam must be reintroduced to a heat source to boost its temperature above the saturation temperature. An experimental superheater loop added to the Vallecitos BWR has enabled it to produce 700F steam at 930 psi. The low-enrichment UO_2 ceramic fuel used for this loop has potential for low fuel cost.

This Superheat Advance Demonstration Experiment (SADE) is a basic test to demonstrate the feasibility of superheated steam as a reactor coolant. It is a vital step in the program for economic nuclear power by 1970.

Its primary objective is to provide an in-pile test facility for superheated steam fuel development. The first phase of the program will provide preliminary data on fuel performance, decay, heat removal characteristics, corrosion product carry-over, and coolant loop radioactive contamination.

The in-core facility for SADE is a single channel element isolated from the VBWR water by a tube replacing a fuel element in the active core. The SADE loop is a completely independent system except for the steam connection. Saturated steam for cooling the test element is taken from the VBWR main steam line. This steam enters and leaves the tube at a refueling port on the VBWR reactor vessel. Air cooling during VBWR start-up and shut down is provided by independent air lines from the compressor to the refueling port flange. Instrumentation is provided to measure pressure level, temperatures, flows and valve positions.

The superheater element is located near the outside of the VBWR active core. The element is a right circular, hollow UO_2 pellet clad inside and out with stainless steel. The steam passes down between the process tube and the outside fuel cladding, then up between the inside fuel cladding and the in-core instrument tube.

Rated output for the fuel configuration now installed in VBWR is 50 kw heat at 825F, 1000 psi superheater outlet.

NUCLEAR SUPERHEATER element mockup is test inserted in VBWR refueling port to check element alignment

Important safeguards include independent air supply for decay heat removal, stored energy in VBWR to supply steam for a limited time, and provision to dissipate heat by thermal radiation from the fuel element to the VBWR water. The SADE control and instrument system is inter-connected with VBWR scram circuits to shut down on excessive temperature, loss of steam or condenser flow, or excessive activity.

Use Realistic Loading Limits, RMEL Told

RMEL speaker says transformer thermal, voltage, economic criteria encourage prevalent but expensive underloading

More effort to peg distribution transformer loading criteria by more realistic sizing of thermal, voltage, and economic limits was advocated recently before the Rocky Mountain Electrical League at Denver, Colo.

Substantial utility investment in distribution transformers justifies this move, said D. H. Mullen, Westinghouse Electric Corp. Underloading, now quite prevalent, could cost utilities more than overloading in view of modern transformers' lower impedance and proved overload capacity.

The term "load", applied to these transformers, must be clearly defined, so as to clarify published articles on loading practice. It is necessary, Mullen emphasized, that the period over which peak demand is measured—whether the daily, average daily, weekly, or annual peak—be precisely stated.

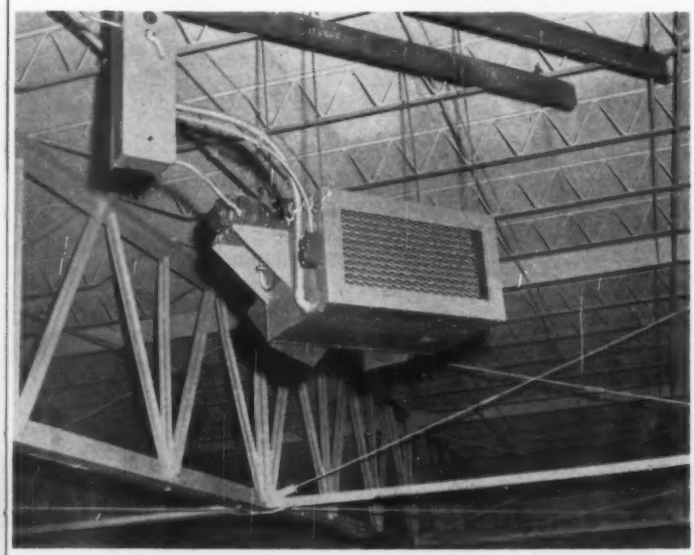
The lower impedances of recent transformer designs have provided a new operating problem related to short-circuit strength, Mullen added. Present industry standards requiring strength of 25 times full load for 2 sec are inadequate, as a 2% transformer will pass 50 times full load if such a load is available from the system.

Acceptable overload of transformers in multi-unit substations tends to increase as experience proves ASA loading guides generally conservative, said J. A. Smith, General Electric Co. Other items favoring higher emergency loading are

(*Continued on page* 92)

BASEBOARD HEATERS in offices, reception rooms and similar areas supplement heat pumps in colder weather

COLD AIR at building entrance is tempered by electric space heaters. Cooling of this location is by heat pumps



RESISTANCE HEATERS are suspended from ceiling in garage area. Sizes range from 5 to 40-kw, fed at 460 v

Service Building

Plan provides operating cost comparison with two conventionally-heated service buildings

L. H. RUHLEN, Commonwealth Associates, Inc, Jackson, Mich.,

G. W. McELHANEY, Ohio Edison Co, Akron, Ohio.

Ohio Edison Co's new Bay Division service building promises data on electric heating installation and operating costs. It is heated entirely by electricity.

Two similar buildings completed within two years of the Bay service center were equipped with "conventional" heating systems. The three buildings are expected to offer a sound basis for comparison of installation and operating costs of the three heating systems represented.

The Bay building uses resistance baseboard heating units, forced air units and heat pump equipment. The type of equipment installed was determined by the use of the areas to be heated or cooled.

Plans for the building were developed to draw comparisons with the buildings having conventional heating systems. Therefore:

1. The building is a normally-designed structure with no special insulation or other features not included when a standard heating system is installed.

2. Air-conditioned areas are the same as those installed for a fuel-heated building.

3. Heat pumps were installed for the air conditioning, and air conditioning was sized not to exceed cooling requirements by more than 20%.

4. The most economical types of electric heating equipment were selected for each application.

5. A variety of equipment was selected to explore the advantages of each.

Design conditions for the building were 0F to 75F for winter conditions and 95 day bulb—76 wet bulb to 80 day bulb—67 wet bulb for summer.

The one-story building has about 35,000 sq ft of usable space, with 7,000 sq ft of office space and 28,000 sq ft of shops, garage, storage and miscellaneous. The building is constructed of concrete blocks and insulated aluminum panels with a built-up roof having 3 in. of thermal insulation. Total electric heating load is 454 kw, including the six 5-ton air-to-air, package-unit heat pumps.

Small unit heaters, installed in the main entrance lobby, temper cold air as it enters the building. They have self-contained thermostats. This area is cooled by heat pumps.

Offices are heated by a split system consisting of heat pumps with overhead air duct distribution and baseboard resistance heaters. Because heat pumps were selected on the basis of summer cooling requirements, 24-kw baseboard heaters provide additional heat needed when the pumps' heating capacities are inadequate. Installed on exterior walls under window areas, these heaters prevent objectionable down drafts during colder weather. They are controlled by line-type thermostats and are independent of the thermostats controlling heat pump operation.

Is Heated and Cooled Electrically

Package-type heat pumps were selected because of simplicity of installation and ease of providing zone control with short overhead duct runs. Also, with multiple units, only the zone served by a single unit is affected when major repairs are needed. This system also provides greater flexibility for temperature control.

Air-to-air heat pumps are used because experience indicated that this type would provide the greatest operating economy. They were purchased with minimum resistance heat, which provides sufficient heat to overcome the cooling effect during the defrosting cycle.

Unit resistance heaters were installed in garage, shop and storage areas because they were the most economical. They also provide air circulation, desirable in the summer. All unit heaters were suspended overhead, and each is controlled by a separate thermostat under the heater, about 4 ft 6 in. above the floor.

The garage area has ventilating fans controlled by a time clock and interconnected with the unit heaters, so that in winter fresh air is warmed before it reaches the working area.

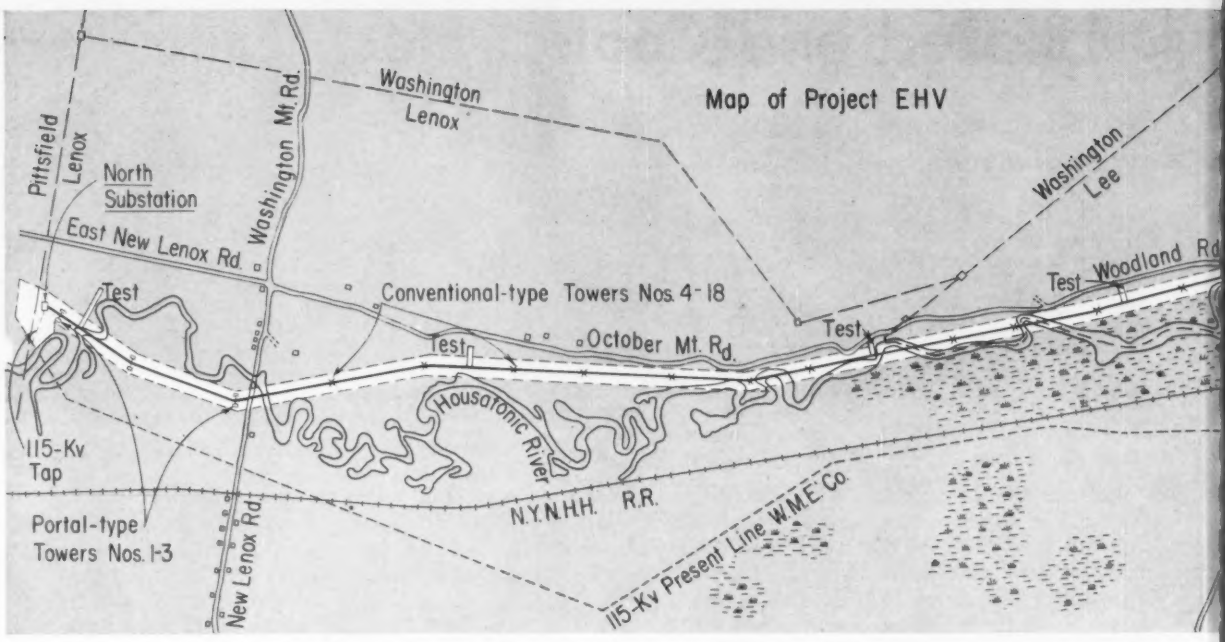
Ohio Edison's two other service buildings that are similar in size, construction and use to the Bay building were built within the last two years. Building "A" has gas fired boilers, a combination hot water and steam heating system with a mechanical air-conditioning system for the office area.

Building "B" has oil fired boilers, a combination hot water and steam heating system with a mechanical air-conditioning system for the office area. An auxiliary tank supplies No. 2 starting oil. No. 5 oil is used after start-up.

Building "A" has 40,927 sq ft of space and cost $161,637, while Building "B" has 33,758 sq ft and cost $151,275. Bay Service Building, having an area of 35,112 sq ft, was built for $143,635.

Because items included in the costs are similar for all three buildings, it can be assumed that any savings obtained are realized from the installation of electric heating. Other benefits not included in the cost comparison are: savings at the Bay building resulting from elimination of boiler room and chimney; more uniform control of temperature, as Bay building control zones are smaller and more numerous; more personal comfort for occupants; and a cleaner building and surroundings because there are no products of combustion.

UNIT-TYPE HEAT PUMPS were sized to meet air conditioning requirements with not more than 20% margin. They are used for heating to extent of capacity. Heat from heat pumps is supplemented by additional baseboard heating



MAP of western Massachusetts shows location of Project EHV, including the 4.3 miles of right-of-way and transmission line, substations, and measurement areas. Power for project to be supplied by Western Massachusetts Electric

Project EHV Construction Begins; Test

Cooperative studies will use protoype power system to analyze EHV transmission problems at 460 kv and 650 kv.

P. A. ABETTI, Manager-Project EHV, General Electric Co, Pittsfield, Mass.

The General Electric Extra-High Voltage (EHV) Project, on which construction began in May near Pittsfield, Mass., is scheduled now to be energized in May 1960. It will enable a thorough study of the present status of EHV transmission systems and of projections of the probable next voltage step in such transmission.

In about 1962 in this country and probably earlier in Canada, transmission systems may go to 460 kv, and continuing progress could produce a second next voltage step, possibly to about 650 kv, in 1975. Since plans for the project were announced (see EW, June 9, 1958, pp 54-56), much equipment has been designed, detailed construction plans have been drawn up, and estimated costs have been more thoroughly investigated.

As planning is well advanced today, more detailed estimates can be made. The entire project will entail an expense considerably in excess of the earlier $5-million estimated. GE's outlay alone will exceed this amount, and the total cost will be about $7.5-million.

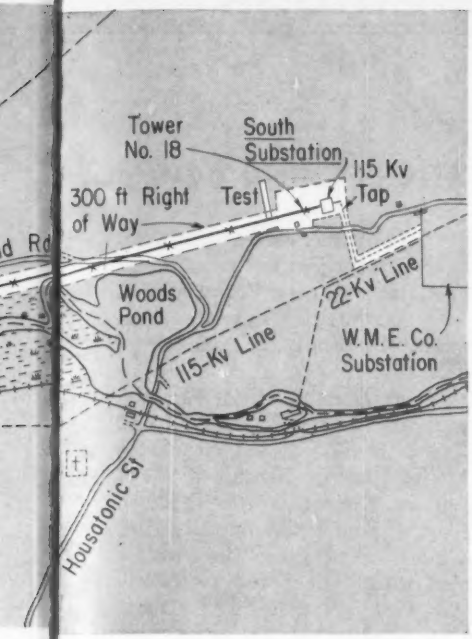
The EHV Project will be a complete prototype power system operating at 460 and 650 kv (750 kv maximum). The two years since its inception were used for acquiring the 4.3-mile right-of-way, land for two terminal substations, and intermediate measurement areas, and for organizing and planning the project in detail. Problems, which the electrical industry must solve to transmit blocks of power reliably and economically at voltages higher than those in use, were reviewed and classified. The project's organization was set up to tackle these problem areas.

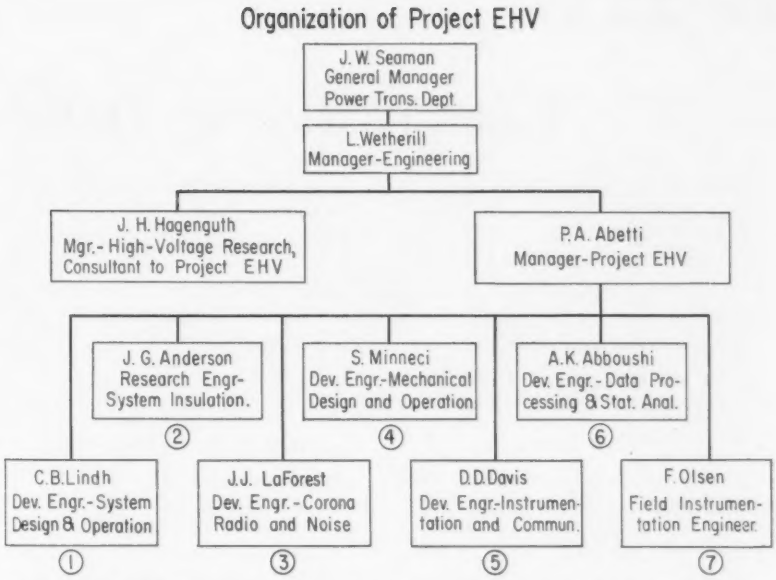
Original project plans called for 18 heavy portal-type steel towers for the full 4.3 miles. Such towers, it was then thought, would give maximum flexibility for testing, for changing the interphase spacings, and for moving conductors from phase to phase without lowering them to the ground. But such structures, it was soon realized, would not be representative of a utility's transmission system; they would weigh more and cost more, and the data obtained would not be applicable to any company's tower costs or erection methods.

Moreover, it was desirable to test very many conductor configurations, with single and multiple conductors per phase and various interphase spacings. Were all configurations to be tested over the entire line within the three years available, May 1960 to May 1963, measurements could be made on each for only three or four months.

But phenomena to be investigated, such as corona, radio noise, and mechanical performance of bundle conductors, are much influenced by weather, so that nine to 12 months are needed to obtain statistically valid results. The aging of new conductors alone seems to take at least three months.

Accordingly, the 4.3-mile line will be split at the third tower from





ORGANIZATION CHART of Project EHV shows General Electric Co personnel in managerial posts. For assigned field of investigation see below

Plans Set

the north end. The short section, 0.65 miles, will comprise three portal-type towers about 200 ft wide, and 80, 130, and 105 ft high, each weighing about 80 tons.

Tower No. 1 will have an elevator for easy access to the instruments installed on it and for servicing a close-circuit television camera through which conductor movement and surface conditions can be observed at all times at headquarters. Tower No. 2 is an angle; Tower No. 3 another dead end. The short section will test a great variety of configurations for about three months each. Phase spacing of 20, 30, 40, and 50 ft will be available there.

The 3.65-mile section from Tower No. 3 to Tower No. 18 will be built, as most utilities build, for maximum economy. There will be only one phase spacing at 460 kv (40 ft) and another at 650 kv (50 ft). At 460 kv, the three phases will be free swinging, as on most transmission lines; at 650 kv, the center phase will be restrained by two insulator strings in vee-connection.

The long section's 15 towers will vary in design and materials. Vari-

(*Continued on page 72*)

Assigned Fields of Investigation

1. System Design and Operation . . . Economics of various ac voltages, of ac, vs, dc, optimum conductor size and configuration for given voltage. R/W. Relative cost and influence of each component. Economics of system reliability. Interaction of apparatus and line. Inductive coordination. Reactive power. Voltage regulation, stability, metering and relaying. Voltage level and apparatus standardization.

2. System Insulation . . . Electrical design of substations. Lighting, switching surges, low frequency overvoltages, power current follow. Continuous service stresses. Grounding, ferro-resonance, recovery voltages, arc deionization. Insulator contamination and leakage. Insulation coordination. Basic impulse insulation levels. Insulation life.

3. Corona & Radio Noise . . . Corona loss. Insulator leakage loss. Radio & TV interference from line and apparatus. Electrical design of insulators, spacers, hardware. Conductor aging. Radio-noise measurements. RF line traps.

4. Mechanical Design and Operation . . . Design of substations, towers, conductors, insulators, spacers and hardware. Mechanical performance of bundle conductors. Icing & galloping. Sleet warning, prevention and melting. Aeolian vibration. Hot line maintenance. Airplane warning. Conductor heating.

5. Instrumentation and Communication . . . Instrumentation planning and design. Meteorology. Carrier current. Microwave. Telemetering. Wire, carrier & radio communication. Transient disturbance metering. Automatic data originating. Analog and digital conversion.

6. Data Processing and Statistical Analysis . . . Analysis of lab and field data. Correlation of data. Preparation of computer programs to predetermine characteristics of EHV lines.

7. Field Instrumentation . . . Installation, operation & maintenance of instrumentation in the field.

Field Testing of Transformer Oil Proves

WILLIAM LAJOUSKY, Test Engineer, Central Maine Power Co, Augusta, Me.

Central Maine Power Co has found that results of transformer oil field tests compare favorably with laboratory tests. Purifying is done on energized transformers (34.5 kv maximum voltage) with two Honan Crane Purifiers. Each unit is supplied with an interfacial tensiometer.

Purifying units are an "R" type unit and a "Purivac". The "R" type is mounted on a tandem wheel trailer, while the "Purivac" is on a truck.

The "R" unit consists of two large tanks, each of which holds 260 lb of Cranite (fuller's earth), a blotter press, and a pump with a ¾-hp motor that will deliver 300 gal of oil per hr. The "Purivac" unit has an electric oil heater and a dehydrator in place of a blotter press.

Oil samples are taken periodically during the process from both the transformer and the purifying unit. Samples from the purifier must test higher than those from the transformer.

Field tests are spot-checked with laboratory tests once or twice each year. Maximum variation has been of the order of one or two dynes.

Field testing eliminates waiting for laboratory test results. It evaluates the condition of insulating oil while purifying is in progress. It indicates the condition of the fuller's earth used.

The ring method is used to determine interfacial tension. Tap water is used to test cleanliness of equipment. Because it is not practical to follow the instruction book recommendations for cleanliness, clean spare beakers are carried in a dust-proof container. By washing the dish with "Dynasol" cleaner or hot water and powdered soap, rinsing with hot water and wiping dry with lint-free paper towels the test com-

Modified Meter

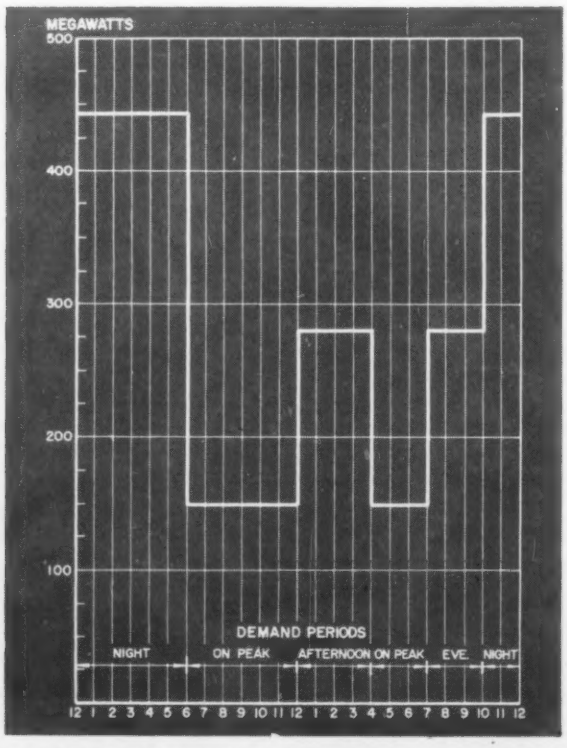
D. J. GOODMAN, Assistant Chief, Technical Services Div, ARO, Inc, Tullahoma, Tenn.

A novel meter arrangement helps dispatchers of the Arnold Engineering Development Center comply with provisions of the power supply contract with the Tennessee Valley Authority regarding maximum load changes.

One provision states that ". . . the loads shall not be increased or reduced (except in emergencies) by more than 20,000 kw per 40 sec, regardless of whether the change is gradual or in steps." Another stipulates maximum demands for each hour of the 24-hr schedule.

The requirement to provide rate-of-load-change information for the dispatcher has been solved by modification of a Leeds and Northrup Speed-O-Max recorder. Two pens are permanently fixed together and the spacing between the two pens is equal to the distance that the chart will travel in 40 sec.

If the load remains steady, the traces drawn by the two pens coincide. For an increasing or decreasing load, the horizontal distance between the traces drawn by the two pens is a direct measure of the amount of load increase or decrease in a 40-sec interval. The chart makes it relatively easy to detect any load changes that are in excess of 20 Mw in this interval.



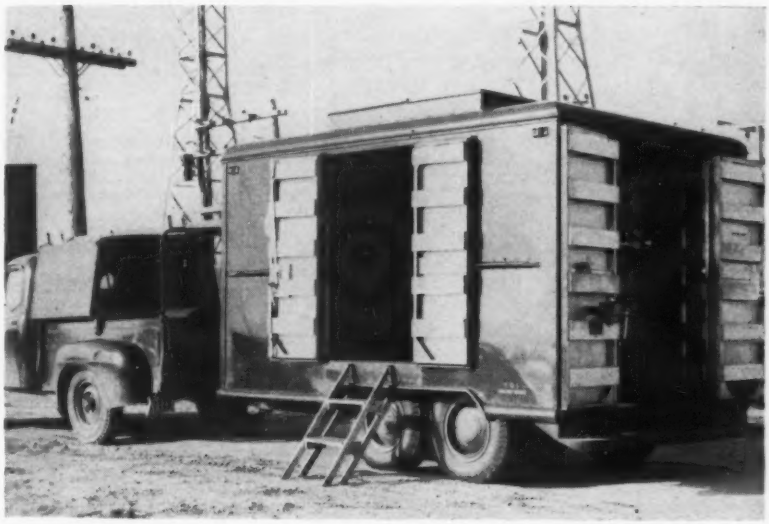
DAILY POWER SCHEDULE indicates maximum demands permitted. TVA supplies power to the Air Force for operation of the Arnold Engineering Development Center

Accurate

pares accurately with tests made with a dish cleaned in the approved method.

In the frequent heating and handling of the tensiometer's platinum ring, its alignment is sometimes changed, causing errors. By replacing the ring in its holder in the same plane as when originally removed, the error is eliminated.

No laboratory technicians or specialists were hired for testing. Assignments for the operation are made from regular electrical and mechanical crews. The company feels that any man using reasonable care will handle the job satisfactorily.

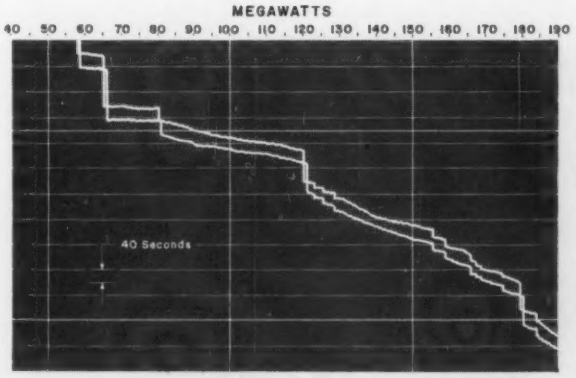


TANDEM-WHEEL TRAILER carries "R" type purifying unit. Assignments for the operation are made from regular test crews. Accuracy has been satisfactory

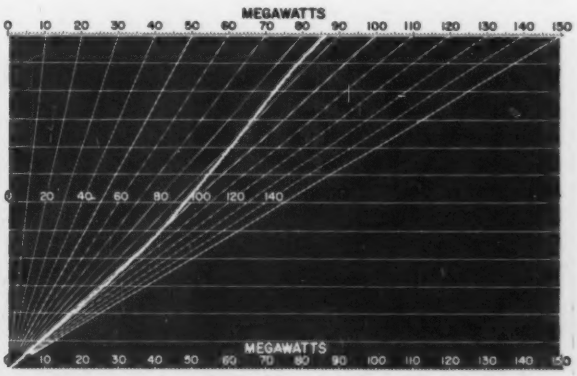
Arrangement Aids Load Dispatches

A method of providing adequate information for the control of integrated demands has been developed that involves the graphic recording of the impulses that actuate the General Electric PD6 demand meter. As in the case of Load Change Recorder, a Leeds and Northrup Speed-O-Max recorder has been modified to receive the impulses that are sent to the demand meter.

Each impulse advances the recorder pen by an amount that will provide full-scale deflection for anticipated maximum loads. At the end of the demand interval, the impulse that resets the demand meter also returns the recorder pen to the zero line. The graphic record provides the power dispatcher with continuous knowledge of the level of the integrated demand.



LOAD CHANGE RECORDER shows rate of change when load is being reduced. The 40-sec interval is shown



GRAPHIC RECORD of demand chart provides dispatcher with continuous knowledge of integrated demand

Normal

But inrush current settings demand careful calculation, especially when distribution circuits are bereft of motor load diversity

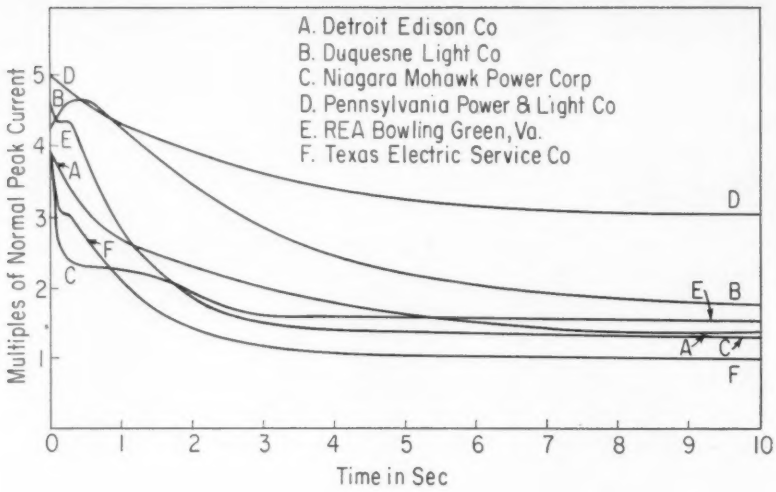


FIG 1—COLD-LOAD INRUSH CURRENT on distribution circuits, as plotted by many utilities, shows wide range

R. S. SMITHLEY, Relay Applications Engineer, Federal Pacific Electric Co, Newark, N. J.

Cold-load pickup, involving distribution circuit protection, can be handled effectively by means of normal relay settings. Such settings meet the inrush-current conditions which are particularly acute when the outage has been so prolonged that diversity of automatically controlled motor load has been lost.

A very large and growing proportion of today's motor load is controlled by temperature, pressure, or other automatic device. On the basis of actual cases, the minimum length of outage causing cold-load pickup trouble seems to be 12 to 15 min.

In cold-load pickup, the critical factors are: The proportion of automatically controlled motor load on a circuit; the season and time of day when the outage occurs; and, how low the voltage drops on motors during inrush-current conditions. Low voltage may preclude motors near a circuit's terminals from reaching normal running speed for a long time, and motors with thermal overload protection may cut off frequently before attaining normal operation.

Some utilities, notably Detroit Edison Co, Duquesne Light Co, Niagara Mohawk Power Corp, Pennsylvania Power & Light Co, REA (Bowling Green, Va.), and Texas Electric Service Corp, have developed curves for cold-load pickup based on extensive tests and calculations. In these curves inrush current ranges from initial values of three to 5 to 1.3 to 3 times peak current after 10 sec. The Texas curve is down to 100% at 4 to 5 sec primarily because of starting of continuously running motors, not loss of diversity of intermittently running motors.

Of the various methods of circuit protection during cold-load pickup, the use of a permanent relay setting based on picking up the circuit's cold load has definite advantages. Although the present or expected load may be the basis for calculating the proper settings, its use would call for revising the settings at least once yearly. Such revisions are eliminated by using the maximum normal rating of the circuit instead.

Use of the maximum normal rating may involve long and careful study of the circuit and possible installation of protective equipment not actually needed for the present load. And the choice of lower rated oil circuit reclosers or fuses needs frequent study of the circuit and of the load distribution on its branches. Circuit

Table I—Determination of Relay Setting to Pick Up Cold Load on Circuit Having 300 Amp Normal Peak for Cold Load Curve B

CDG 13 Very Inverse Relay Set 8 Tap on 400/5 CT.				Relay Settings Under Investigation — 640 Amp Pickup		
Time Sec	Av. Times Normal Peak Current	Av. Current	Multiple Relay Pick-Up	0.3 Sec. @ 10X	0.25 Sec. @ 10X	0.2 @ 10X
0. –0.5	4.55	1365	2.13	2.6 –0.5=2.1	2.11–0.5=1.61	1.65–0.5=1.15
0.5–1.0	4.42	1337	2.08	2.2 –0.5=1.7	1.77–0.5=1.27	1.23–0.5=0.73
1.0–1.5	4.02	1207	1.89	2.12–0.5=1.62	1.62–0.5=1.12	0.95–0.5=0.45
1.5–2.0	3.65	1095	1.71	2.13–0.5=1.63	1.49–0.5=0.99	0.58–0.5=0.08
2.0–2.5	3.32	996	1.56	2.30–0.5=1.80	1.35–0.5=0.85	Trip
2.5–3.0	3.02	906	1.42	2.65–0.5=2.15	1.22–0.5=0.72	
3.0–3.5	2.75	825	1.29	3.29–0.5=2.79	1.20–0.5=0.70	
3.5–4.0	2.53	760	1.19	4.20–0.5=3.70	1.15–0.5=0.65	
4.0–4.5	2.37	712	1.11	7.2 –0.5=6.7	1.15–0.5=0.65	
4.5–5.0	2.26	678	1.06	Above 10.0	1.40–0.5=0.90	
5.0–5.5	2.17	652	1.02		1.5 –0.5=1.00	

Relay Settings Handle Cold Load

extensions also may involve modification of the protection, regardless of the care with which the circuit calculations had been worked out. Most distribution circuits vary sufficiently to require study and design on an individual basis.

Once a circuit has been studied and its cold-load inrush curve developed, an appropriate overcurrent relay may be chosen. Relays are designed with different time characteristics, namely, inverse, very inverse, and extremely inverse.

A circuit having a cold-load inrush curve like Curve B in Fig 1 may be assumed to have a normal peak load of 300 amp. On such a circuit, relays with the very inverse or extremely inverse time characteristics could pick up the cold load. But a relay with the inverse time characteristic would trip in 2 sec, not allowing enough time for the cold-load inrush to subside.

The relay selected, its particular setting can be calculated for permitting cold-load pickup. For this there are several methods, all involving work with the cold-load inrush curve and the curves of the relay's time-current characteristics. One method is as follows:

1. Determine the seconds in which the inrush current just drops to relay pickup.

If the peak normal current were 300 amp, the relay pickup 640 amp, and the cold-load curve Curve B in Fig 1, this time would be 5.4 sec. This is calculated by dividing the relay pickup current by the peak normal current to obtain the multiple of peak normal current, (640/300 = 2.13). This point is then located on the vertical coordinate of the curve, and the time, 5.4 sec, is determined on the horizontal coordinate.

2. Divide the area under the inrush curve into small increments of time, say 0.5 sec, and calculate for each of these time increments the multiple the current represents in terms of relay pick-up current.

This involves a triple calculation for each time increment. First, the determination of the average times normal peak current, then the average current, and finally, the multiple of relay pick-up current. E.g., on Curve B, in the time interval between 2.0 and 2.5 sec, these calculations would involve the following:

Determining from the curve the times normal peak current for both 2.0 and 2.5 sec and taking their average, (3.48 + 3.16 = 6.64/2 = 3.32). Then multiplying this by the normal peak current to get the average current, (3.32 × 300 = 996 amp). Finally, dividing this by the relay pick-up current to obtain the multiple of relay pick-up current (996 amp/640 = 1.56 amp).

If similar calculations are made for each 0.5-sec

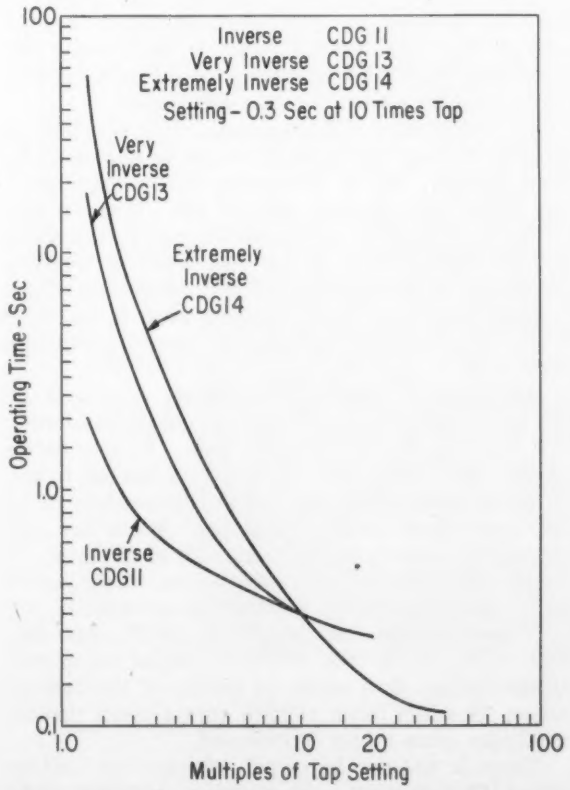


FIG 2—RELAYS are compared with regard to their respective characteristics, operating time, multiples of tap settings

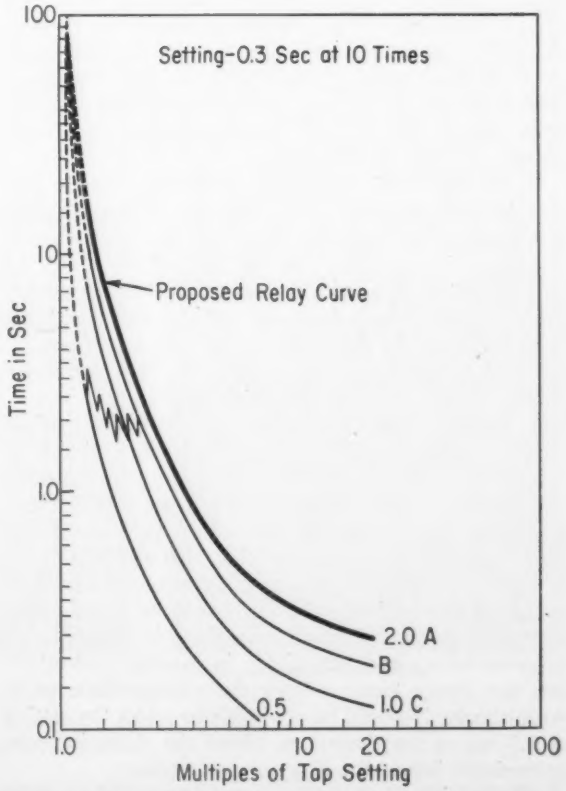


FIG 3—RELAY SETTING is checked for its capability to permit cold-load pickup, using very inverse CDG unit

Table II—Various Settings for CDG 13 Very Inverse Relay

Relay Pick-Up amp	Setting Time sec @ 10X	Time At Av. Current sec	Time Over 5.4 sec	Relay Trip
640	0.15	3.5	...	Yes
640	0.20	4.8	...	Yes
640	0.25	6.2	0.8	No
640	0.3	7.5	2.1	No

increment between zero and 5.4 sec, when the disk ceases to rotate, the results indicated in the first four columns of Table I are obtained.

3. Draw the curve of the relay setting to be investigated. For the CDG 13 very inverse relay, with 640 amp as pick-up current and a time setting of 0.3 sec at 10 times tap, this would become Curve A in Fig 3.

4. From this curve, find the time for the highest multiple of relay pick-up current. This is done by taking the highest multiple of relay current, 2.13, locating it on the horizontal coordinate of Curve A and finding the time, 2.6 sec, on the vertical coordinate.

5. Subtract 0.5 sec from the time found, obtaining the remaining time, and at this point on the graph draw a new curve of the same relay setting. Subtracting 0.5 sec from the time obtained, 2.6 sec, gives the time remaining, 2.1 sec, through which point a new Curve B is drawn for the CDG 13 very inverse relay.

6. On the new curve locate the point of the next highest multiple of relay pickup, obtain the time, and after subtracting 0.5 sec, draw a third curve through the point representing this time. With the next highest multiple of relay pickup, 2.08, the time calculated from Curve B is 2.2 sec. After subtracting 0.5 sec from this, a time of 1.7 sec is obtained, at which point a new Curve C is drawn.

7. Continue this procedure until the inrush current just drops to the relay pickup. When the time continues to increase, the relay will not trip; when it decreases, it may trip. In the case of the CDG 13 very inverse relay, with a setting of 0.3 sec at ten times tap, the times increase and the relay will not trip. This can be determined from Fig 3 or from the calculations used to draw the curves. The latter are summarized in column 5 of Table I.

8. Repeat steps 3 through 7 for other relay settings to be investigated. When the setting is changed to 0.25 sec at ten times tap, the time increases and the relay will not trip. This can be seen in column 6 of Table I. But when the setting is changed to 0.2 sec at ten times tap, time decreases and the relay will trip.

Thus two relay settings are applicable—0.3 and 0.25 sec, each at ten times tap. It should be noted, however, that there is obvious inaccuracy in interpolating between curves and, especially, in drawing curves below the lowest curve among the characteristic ones. Accordingly, it would be advisable to select the setting of 0.3 sec at ten times tap, where the times increase appreciably before the disk ceases to rotate.

A faster, but generally less accurate method of establishing the relay setting is based on determining the average current from the cold-load curve and checking the relay time for this average current. The method is reliable only when the maximum cold-load current does not greatly exceed 200% of the pick-up current at the relay. For accuracy, the relay near pickup must operate at all times on the essentially straight line portion of the time characteristic curve. This method works this way:

1. Determine in seconds when the inrush current just drops to relay pickup. This is calculated as in step 1 above.

2. Calculate the average multiple of normal peak current. From the cold-load curve, take an average of the normal peak current at zero and 5.5 sec (4.33 + 2.12 = 6.45/2 = 3.23).

3. Determine the average current and the multiple this represents in terms of relay pickup. That is, multiply the multiple of normal peak current by the normal peak current (3.23 × 300 amp = 968 amp). Divide the product by the current at pickup to get the multiple of current pickup, i.e., relay (968 amp/640 amp = 1.51).

4. Determine the time of the setting to be investigated. This is done by consulting the time-current characteristic curve. For the CDG 13 very inverse relay with a setting of 0.3 at ten times tap, this is 7.5 sec, which is 2.1 sec more than the time, 5.4 sec, at which the disk ceases to rotate, indicating that the relay will not trip.

5. Continue determining other settings as desired. This is done as in the previous step, the calculations in Table II being thus derived.

Both methods give essentially the same results, as they deal with the portion of the curve that is nearly a straight line. Yet the 0.3 setting is preferable. This is because the 0.8 sec remaining for the 0.25 sec time setting may be enough for reasonable safety.

Back-up protection is important. It is also difficult to achieve when feeder relays are set to pick up cold-load current. Yet a distribution circuit needs it in the event that a breaker fails to trip. Back-up protection is obtainable with relays designed to trip either the transformer bank or bus sectionalizing breakers, or both, or through the use of high-tension transformer bank fuses. It is effective when it can clear all faults on the feeder main and overlap the first branch protection.

Backup must select with protective equipment on the source side. The equipment should be transformer line relays or high-tension bank fuses. Back-up relays should receive the total current of the faulted feeder. In multi-bank stations the sum of the currents of all the transformer banks is required. When bus sectionalizing breakers are used, the sum of the bank and tie breaker currents feeding the section of the bus to which the faulted feeder is connected is required.

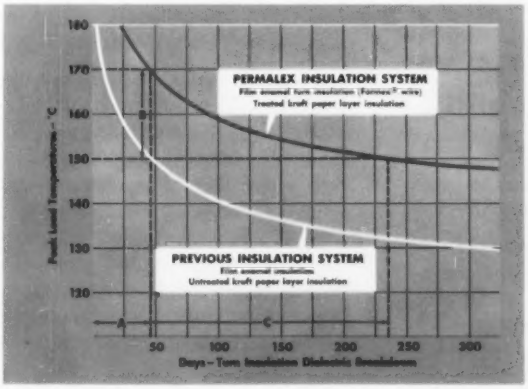
Where back-up relays receive the total output current of the station, the maximum station rating constitutes an excellent guide for pickup of the back-up relays. A safety factor of 10% should assure that the maximum rated output is delivered.

There is another important criterion for back-up relays: They must not notch closed on successive feeder faults or automatic reclosing sequences on persistent faults on one or more feeders simultaneously.

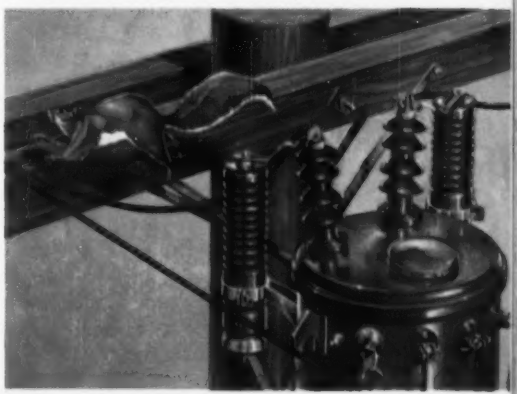
GENERAL ELECTRIC ANNOUNCES . . .

NEW 1959 Distribution Transformer

NEW Permalex* insulation permits 20% additional load with full transformer life.



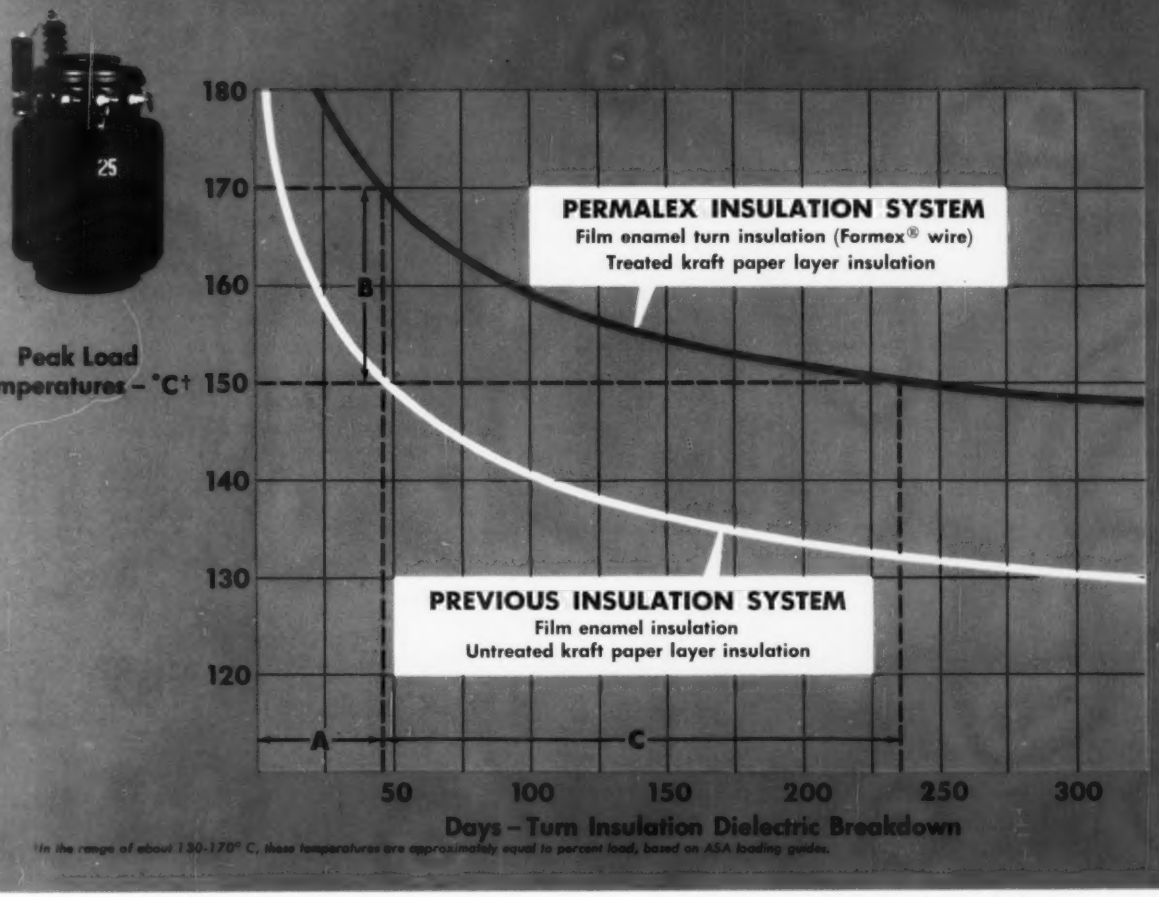
NEW Melalast* finish prevents service outages caused by birds and squirrels.



*Trademark of General Electric Company

GENERAL ELECTRIC

NEW 1959 GENERAL ELECTRIC DISTRIBUTION TRANSFORMER



NEW 1959 G-E DISTRIBUTION TRANSFORMERS, with Permalex insulation, provide utilities important savings in operating costs. For example, A shows life of former transformer at 150% of rated load. B shows how Permalex insulation increases loadability 20% with same life. C shows increased life—almost 400%—at present loads with new General Electric Permalex insulation system.

PERMALEX

Insulation Gives G-E Transformers Exclusive 20% Added Loadability with Full Transformer Life

Standard on the new 1959 General Electric pole-type distribution transformer, Permalex insulation brings electric utilities important savings in operating costs. You can get increased transformer loadability, or increased transformer life, or a combination of both. The new transformer will be available through 167 kva.

Users can increase transformer loading an additional 20% of nameplate rating and still get full transformer life — thanks to the increased loadability permitted by Permalex, the new General Electric insulation system.

Utilities who normally remove transformers, or add units, when peak load on the transformer reaches 150% of rating, for example, can now load to 170% and obtain the same long transformer life as before. Or you can utilize increased thermal stability to get 400% longer life with present load, or a combination of both increased life and load.

WHY PERMALEX GIVES EXTRA STRENGTH

The new Permalex insulation system uses a cyanoethylated kraft insulation material, patented by G.E., to preserve high dielectric strength. Cyanoethylation of the kraft retards formation of moisture, released by cellulosic materials when subjected to load.

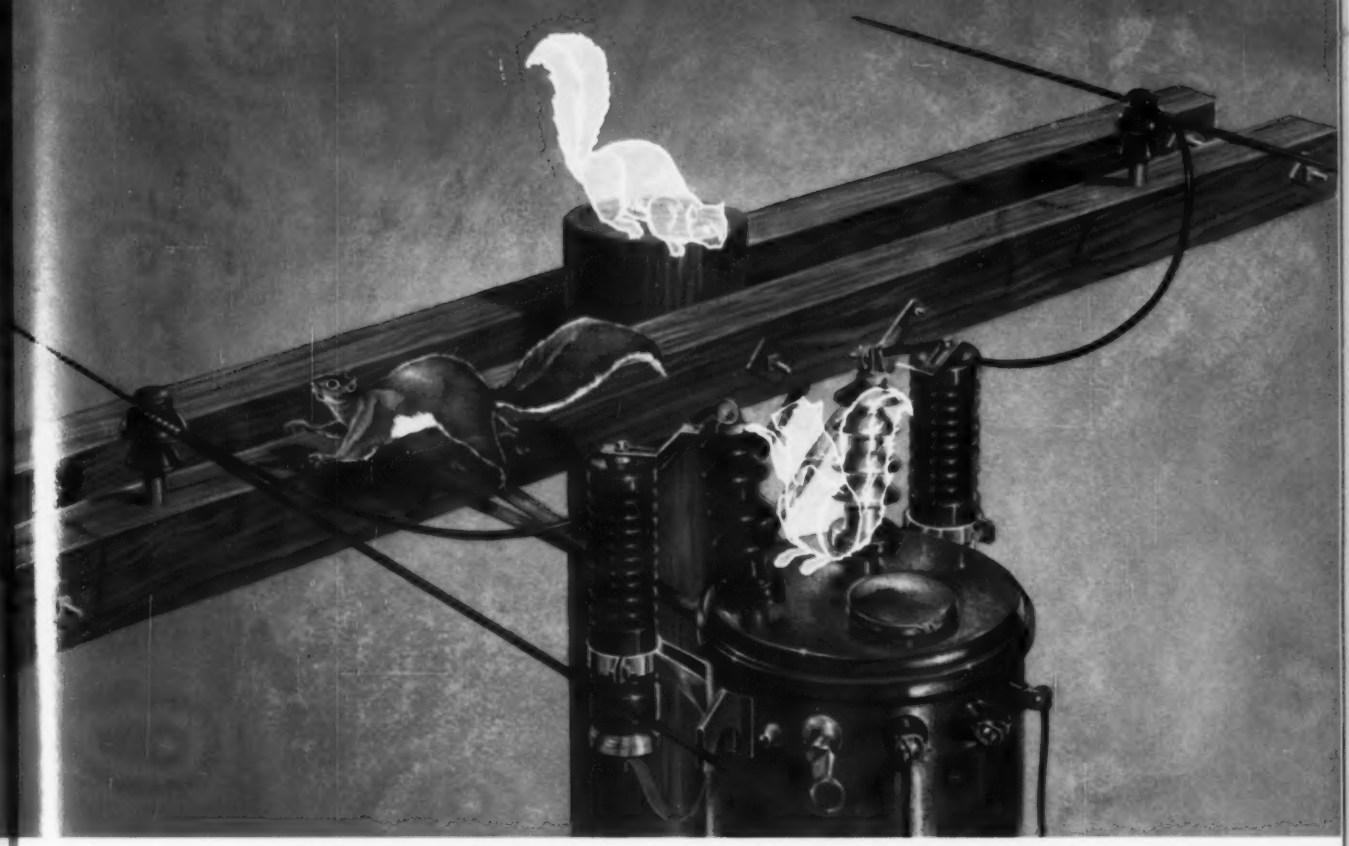
In the Permalex insulation system, cellulosic materials are treated in raw pulp stage to replace "OH" chemical groups with "Cyanoethyl" groups. Since this retards water formation, the new G-E transformer withstands better the higher temperatures which accelerate aging of insulations not treated by the cyanoethylation process.

PERMALEX IS COMPATIBLE

Permalex is completely compatible with everything in the transformer, is clean, safe and odorless. It has no detrimental effect on components such as enamel film insulation, steel or aluminum parts, or oil.

The new 1959 General Electric distribution transformers with exclusive Permalex insulation will be available at no price premium.

REDUCES UTILITY OPERATING AND MAINTENANCE COSTS



MELALAST FINISH ON COVERS of new G-E distribution transformers prevents outages caused by birds and squirrels, eliminates need for special "bird guards" or terminal taping. Slight shock sends visitors safely on their way, as shown in the artist's conception above.

MELALAST

Finish on Cover Prevents Outages Caused by Squirrels and Birds

New savings in installation and maintenance expenses are now possible with Melalast finish on covers of General Electric pole-type distribution transformers. This cost-saving feature is provided at no price premium on all ratings above 5 kv.

Melalast finish is a modified epoxy resin which insulates birds and squirrels from the grounded cover, thus preventing outages and customer complaints. It is applied to both main and handhole covers and cover bands.

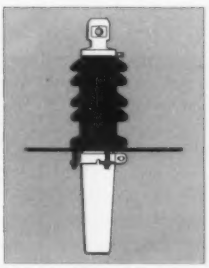
The Melalast coating protects from line to ground but still provides a slight shock, sending squirrels and birds safely on their way. Melalast finish also provides improved corrosion resistance.

Melalast finish, from the G-E Pittsfield laboratories, is another added value benefit which utilities derive from General Electric research and development.

GENERAL ELECTRIC

OTHER ADDED VALUE BENEFITS OF NEW G-E DISTRIBUTION TRANSFORMER

NEW BUSHING on the 1959 General Electric distribution transformer permits replacement of high-voltage fuse without removing the bushing. This helps reduce maintenance costs. In addition, positive method of internal clamping eliminates external parts, potential sources of corrosion.

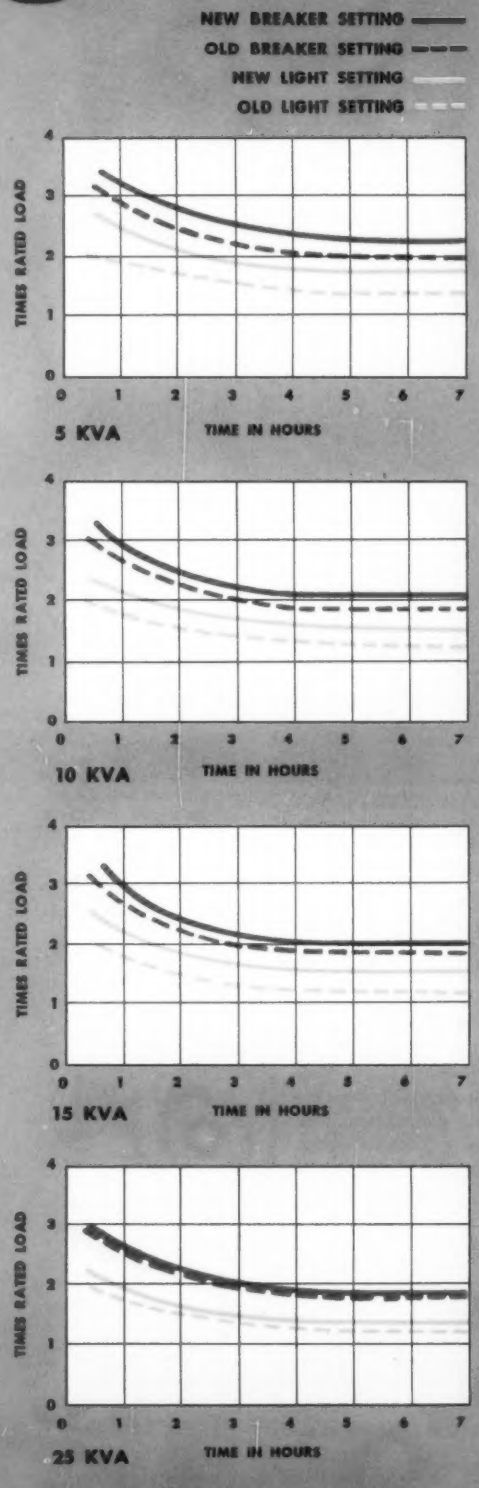


NEW ROLLED-UNDER BASE on G-E distribution transformers through 100 kva reduces maintenance costs by minimizing finish damage from scraping. Minimizes floor and truck-bed scuffing.

NEW LIGHT AND BREAKER SETTINGS make usable the extra loadability possible with Permalex insulation. Graphs and further details on following page.

→

NEW 1959 GENERAL ELECTRIC DISTRIBUTION TRANSFORMER REDUCES UTILITY OPERATING AND MAINTENANCE COSTS



LIGHT AND BREAKER SETTINGS are uprated on new G-E Type HSBA distribution transformers. The new settings make usable the increased loadability which Permalex insulation provides. Curves are based on 7200-volt ratings, 75 percent initial loading, 35 C ambient.

NEW Higher Light and Breaker Settings Make Extra Loadability Usable

The new 1959 General Electric distribution transformer establishes a logical, comfortable load-growth margin over the entire kva range for self-protected units. New light and breaker settings provide greater margins than the pre-1956 settings, thus avoiding "hot-weather" tripouts as air conditioning loads increase. Yet settings are not unrealistically far apart.

The new light and breaker settings reflect utility requirements to avoid both the too narrow margins prior to 1956 and too wide margins which make it difficult, if not impossible, to use the light as a warning for the coming changeout. Settings on the new General Electric Type HSBA distribution transformers make it simple to plan changeouts in advance, without any change in utility operating practices. And only on the new G-E transformer do you get these higher light settings and the resulting operating savings.

A new, red-bordered nameplate on transformers with Permalex insulation provides easy, positive identification of the increased loadability for both conventional and self-protected transformers. For users of HSBA transformers this nameplate will also identify the increased breaker settings. Important as it is, Permalex insulation is just one of . . .

10 REASONS WHY GENERAL ELECTRIC IS YOUR BEST TRANSFORMER BUY

1. **New Permalex Insulation** increases transformer loadability by 20%.
2. **New Melalast Finish** on cover ends outages caused by animals.
3. **Formex Wire** helps cut size and weight, makes handling and changeouts easier.
4. **AL/CU Terminals** provide sure electrical contact with both aluminum and copper conductors.
5. **Strenicor Clamps** virtually eliminate secondary terminal failures and resulting service calls.
6. **Stainless Steel Bands, Nitrile Rubber Gaskets** simplify maintenance, resist corrosion.
7. **Impulse Testing** at factory assures extra years of reliable service.
8. **Self-Protected Transformers** are equipped with superior Thyrite* Magne-valve arresters.
9. **Computer-Controlled Ordering System** speeds delivery, helps reduce utility inventories.
10. **Careful Packaging,** guided by impact and vibration tests, cuts shipment damage.

Ask your G-E sales engineer for further details on the savings provided by new Permalex insulation and Melalast finish—and the 10 reasons why General Electric is your best transformer buy. Or write for bulletin GEA-6070 to G.E. Co., Section 431-85, Schenectady 5, N. Y.

*Reg. Trademark of G. E. Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Guides Reduce Storage Battery Costs—II*

Application engineering of nickel-cadmium batteries by Gulf States Utilities Co leads to guides for proper selection and sizing and facilitates comparison of costs

LEROY J. BODEMAN, Equipment Application Engineer, Gulf States Utilities Co, Beaumont, Texas

This guide results from a study of battery manufacturers' recommendations tempered with operating experience and adjustments and from estimates on the life expectancy of various types of batteries. The guide is an aid to selection and sizing of the batteries.

Applications—**(1)** For supervisory requirements or certain breaker-tripping requirements, where the continuous current is very small. **(2)** For applications where operating temperatures normally exceed 100F, also for metal-clad switchgear.

How To Size a Nickel-Cadmium Battery

Total load on the bus is divided into three classes:

1. Maximum ampere rating for circuit breaker tripping is based on the 1-min rating of the battery. This maximum ampere rating is the sum of all circuit-breaker tripping currents that may possibly be supplied simultaneously. Breaker tripping shall be assumed to occur at the end of a 12-hr outage.

2. Continuous load of indicating lamps and control devices must be carried by the battery for 12 hr without the help of a battery charger.

3. Emergency lighting and power shall be supplied by the battery for 3 hr.

For each of these load classes the ampere-hours required and drawn are computed.

The number of cells is determined by sizing the battery so that the end voltage per cell times the number of cells is equal to 42 v or more for a 48-v battery and 105 v or more for a 120-v battery.

Example Illustrates Selection Procedure

GIVEN—Classes of loads are:	
Carrier channel for 12 hr	2.25 amp
Indicating lights for 12 hr (8 lights at 0.035 amp each)	0.28 amp
Emergency lighting for 3 hr	25.0 amp
Circuit breaker closing current, 4 breakers, 1 min	26.0 amp

SOLUTION—Most severe load combination should be assumed. This combination would be: For the first 9 hr, 2.53 amp for the carrier and indicating lamps; for the next 3 hr, the 2.53-amp load plus the 25-amp emergency lighting or a total of 27.53 amp; and for the final moments, the 27.53-amp load plus the 26-amp circuit-breaker closing current or a total of 53.53 amp.

Calculate the ampere-hours required:

1a. Carrier and indicating lights for 9 hr (amperes required) ÷ (amperes expressed) in terms of C = ampere-hours

[Amperes expressed in terms of "C" (see table)]

$2.53 \div 0.111 = 23$ amp-hr

2a. Emergency lighting plus item **1a** for 3 hr

$27.53 \div 0.27 = 102$ amp-hr

3a. Circuit breaker tripping plus item **2a** for 1 min

$53.53 \div 1.75 = 30$ amp-hr

Calculate the ampere-hour drain:

1b. Carrier and indicating lights for 9 hr

$2.53 \times 9 = 23$ amp-hr

2b. Emergency lighting plus item **1b** for 3 hr

$27.53 \times 3 = 83$ amp-hr

3b. Circuit breaker tripping plus item **2b** for 1 min

$53.53 \times 1/60 = 0.9$ amp-hr

Determine total ampere-hours using figures for required and drain:

1c. Carrier and indicating lights for 9 hr

Required **(1a)**	23	23 amp-hr
Removed **(1b)**	23	
Remaining	0	

2c. Emergency lighting plus carrier and indicating lights for 3 hr

Required **(2a)**	102	
Available from **1c**	0	
Additional required	102	102 amp-hr
Removed **(2b)**	83	
Remaining	19	

3c. Circuit breaker tripping plus emergency lighting, carrier, and indicating lights for 1 min

Required **(3a)**	30	
Available from **2c**	19	
Additional required	11	11 amp-hr
Total amp-hr required		136

If the end voltage of the cell selected is 1.14 v, then 37 cells shall be used for a 48-v battery.

Time Alters Capacity Factor

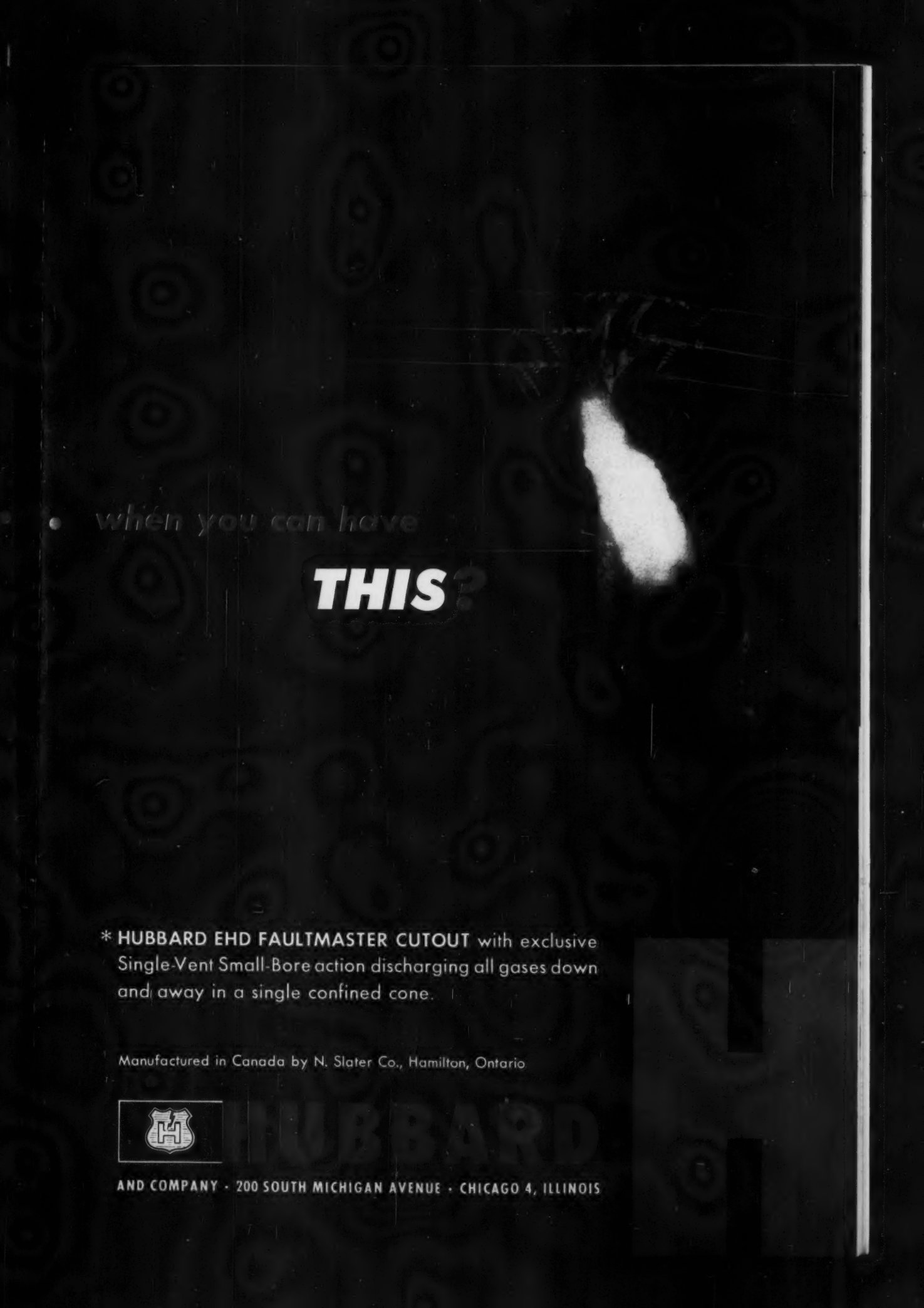
Seconds	"C"	Minutes	"C"	Hours	"C"
1	2.25	1	1.75	1.0	0.600
2	2.17	1.5	1.63	2	0.349
5	2.05	2	1.56	3	0.270
10	1.97	5	1.30	4	0.227
15	1.92	10	1.10	5	0.200
20	1.88	15	1.00	6	0.167
30	1.83	20	0.90	8	0.125
45	1.78	30	0.80	10	0.100
60	1.75	45	0.68	12	0.083

* Part I—"Application Engineering of a Lead-Acid Battery" was published in Electrical World, June 1, 1959, p 86, and Part III—"A Method to Determine the Annual Cost of a Battery" will appear in a subsequent issue.

when it comes to CUTOUTS

* **PRESSURE-RELIEF CAP CUTOUT** photographed in action discharging the cap, fuse link button head, and ionized gases upward into the primdry.

* *Both photographs are open shutter exposures, taken of cut-outs tested on a 15 kv circuit with 8000 amperes available.*



* **HUBBARD EHD FAULTMASTER CUTOUT** with exclusive Single-Vent Small-Bore action discharging all gases down and away in a single confined cone.

Manufactured in Canada by N. Slater Co., Hamilton, Ontario

HUBBARD

AND COMPANY · 200 SOUTH MICHIGAN AVENUE · CHICAGO 4, ILLINOIS

Procurement & Products

PRICES ▶ **Aluminum prices grow firmer.** Most buyers will probably pay higher prices beginning July 1 says Engineering & Mining Journal's market publication. Basis of higher price forecast is recent Kaiser Aluminum letter to customers changing transportation terms on shipment of aluminum products from "f. o. b. shipping point," to "f. o. b. destination." This is the first explicit and public move toward elimination of sharp discounts.

FUEL ▶ **Use of coal by electric utilities will rise 34%** during next five years, predicts Raymond E. Salvati, president of Island Creek Coal Co. That would bring utility use to 205 million tons annually, and mean utilities would comprise 45% of the total coal market.

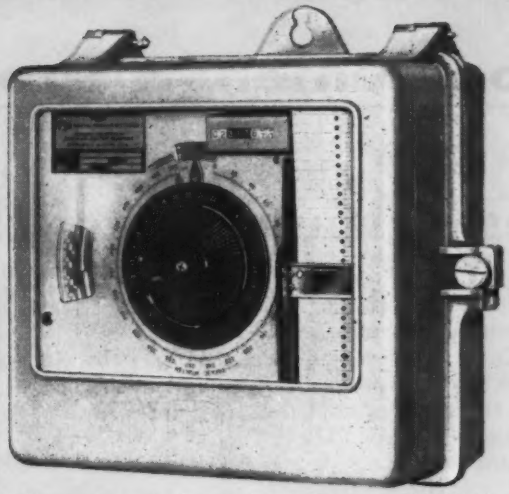
MANAGEMENT ▶ **Few purchasing executives have their performance directly measured** by top management and of those submitting reports to top management most are given orally or informally. This was finding reported by J. P. Blumer, Gulf Power, at the EEI Purchasing & Stores Meeting. Where formal reports were submitted to top management, data included: (a) Dollar cost of operating purchasing department per dollar purchased; (b) Number of requisitions received per month; and (c) Number of purchase orders per month.

SIZE OF JOB ▶ **Procurement is truly an all-embracing** job in a utility, requiring the cooperation and the coordination of several departments for the purchase of almost any sizeable item of equipment. A study we have seen indicates that the utility executive, department head, or engineer exercises some procurement responsibility in an average of 2.8 company departments, such as generation, transmission, distribution, substations, sales, etc. The man who has a say in procurement functions in an average of 4.0 jobs such as purchasing, planning, design, construction, or maintenance.

RESEARCH ▶ **Research and testing projects now underway will guide your future** procurement practices. Among the projects now going on are "Project EHV," which could help to set the pattern for product and equipment designs in the very high voltage field for years to come. Some 33 different classes of materials and equipment will be developed and tested in the experimental project **(see p 42).**

Commonwealth Edison will build 6-mile experimental aluminum tower transmission line, in line with company's established practice of continually evaluating materials and methods.

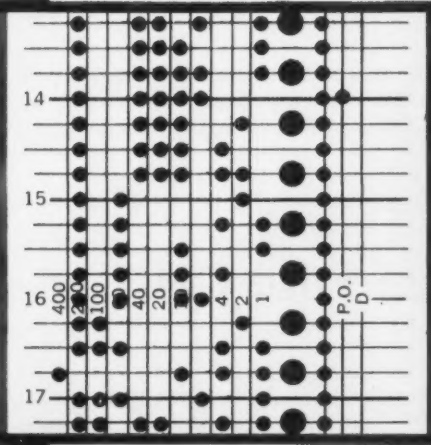
News of Manufacturers . . . . . page 64
New Equipment . . . . . page 83
Readers Service . . . . . page 85



Convert demand load data to IBM cards for quicker load analysis—accurate billing

The new, improved Sangamo-FP digital demand recorder facilitates automatic data processing . . . can be used for all demand recording purposes . . . includes Kw, Kvar and Kva values.

You get more for your money in load survey applications—twice as many impulses per interval . . . faster translating . . . plus a visible record that lets you see peaks and outages right after they occur! Sangamo's automatic translator permits direct, accurate and economical conversion of tape data to standard IBM cards. It can be used with your present key punch equipment, or you can obtain fast translating service from Sangamo at a nominal cost.



SANGAMO-FP DIGITAL DEMAND RECORDERS

GIVE *A VISUAL* RECORD . . .
PICK THE PEAK and READ IT!

The enlarged section of tape above shows how simple it is . . . See the punch farthest to the left at 16¾ hours? Read it. 400 plus 10 plus 4 plus 1—415. A quick glance at the right hand of the tape shows a power outage at 14 hours. The punched tape provides a permanent, *positive* record that eliminates arbitrary interpretation of charts.

The DDR is available for 5, 15, 30 and 60 minute intervals—easily converts from one interval to another. A single roll of tape (15 minute interval) permits 3 months of continuous recording *yet allows monthly record removal*. Get the complete story from your Sangamo Representative or write for Bulletin 360.

SANGAMO Electric Company

SPRINGFIELD, ILLINOIS

SANGAMO 50TH ANNIVERSARY 1900 - 1950

SM50-3

Westinghouse Exciter Eliminates Brushes

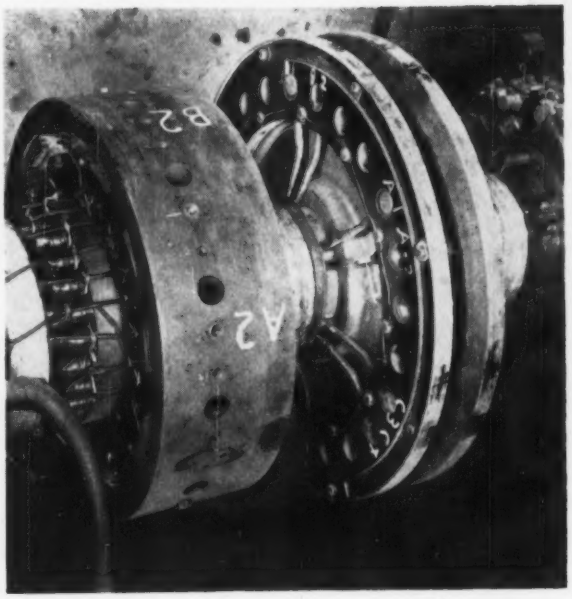
A 180-kw 250-v rotating rectifier system for use on an ac generator is now being built for West Penn Power Co by Westinghouse Electric Corp. This new excitation system will eliminate current-collecting brushes, rings, and commutators. It is expected to be in operation this year.

Mounted on the same shaft as the ac turbine-generator field, the system consists of an ac exciter and a rotating rectifier. The ac exciter's rotating armature output is fed along the shaft to the rotating rectifier. The rectifier's output, in turn, is fed to the field of the ac turbine-generator. A Mag-a-Stat regulator, acting on the stationary field of the ac exciter, controls the strength of the ac turbine-generator field.

The ac exciter, a proven design with a rotating armature and a stationary field, generates 420-cycle 3-phase power which is fed to the rectifier. This exciter may be excited separately or by a permanent magnet ac pilot exciter whose output is rectified by a stationary rectifier.

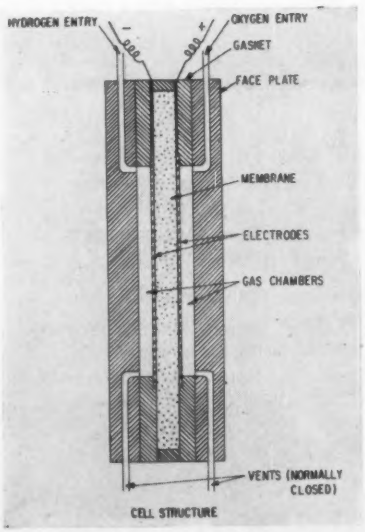
The rectifier is made up of silicon diodes arranged for the desired dc output to meet the requirements of the ac turbine-generator field. Sufficient capacity is provided so that the diodes will not be overloaded even though about 30% of each phase is out of service. Fuses protect the elements of the rectifier.

A laboratory prototype of the new rotating rectifier is shown in the accompanying photo. Dual discs at the



right carry fuses; the drum at left supports diodes in finned blocks and resistors for control of series-parallel circuitry. Final design will be more compact, Westinghouse reports.

GE Develops Hydrogen-Oxygen Fuel Cell



A fuel cell—a device that produces electricity directly from gaseous fuel—has been developed by General Electric Co in a "new improved form." It generates electricity by means of a chemical reaction of hydrogen and oxygen, with water as a by-product.

The device operates efficiently at room temperature and normal atmospheric pressure. Thermal efficiencies over 60% have been obtained, GE reports.

The performance of the cell in terms of net power per unit weight (or per unit volume) is attractive. Power densities of the order of 1 to 2 kw per cu ft have been calculated on the basis of present data.

The cell consists of a round plastic disc about ½-in. thick and 3-in. diam. Its hollow interior is divided into two chambers by a plastic membrane which has an electrode in contact with each of its sides. Hydrogen is fed into one chamber, and oxygen into the other (or oxygen in the air can be used). At one electrode, the hydrogen molecules break up into electrons and positively charged hydrogen. The electrons travel through an external circuit to the other electrode, thus creating an electric current. The positively charged hydrogen moves through the membrane to the other electrode, where it combines with oxygen and the electrons from the external circuit to form water.

(*Continued on p* 68)

There is no substitute for . . . . . .

WESTERN RED CEDAR POLES

Thermal Process treated, "top-to-butt" with
PENTAchlorophenol

Genuine Western Red Cedar, nature's finest, is made immune "top-to-butt" to any deterioration by the THERMAL PROCESS with PENTAchlorophenol preservative. Uniform . . . lightweight . . . clean to climb . . . safer . . . straighter —for *tops* in pole quality, appearance and service life specify Western Red Cedar, Thermal Process full-length treated with PENTAchlorophenol. Meets EEI and AWPA specifications.

Produced, Treated and Shipped by the following

Western Red
AND
Northern White Cedar Association
MEMBERS

PAGE & HILL, INC.
Minneapolis 3, Minnesota

SCHAEFER-HITCHCOCK CO.
Sandpoint, Idaho

VALENTINE CLARK CORPORATION
St. Paul 8, Minnesota

BELL LUMBER & POLE COMPANY
Minneapolis 1, Minnesota

B. J. CARNEY CO.
Minneapolis 3, Minnesota
and
Spokane 1, Washington

CEDAR SERVICE, INC.
Minneapolis 40, Minnesota

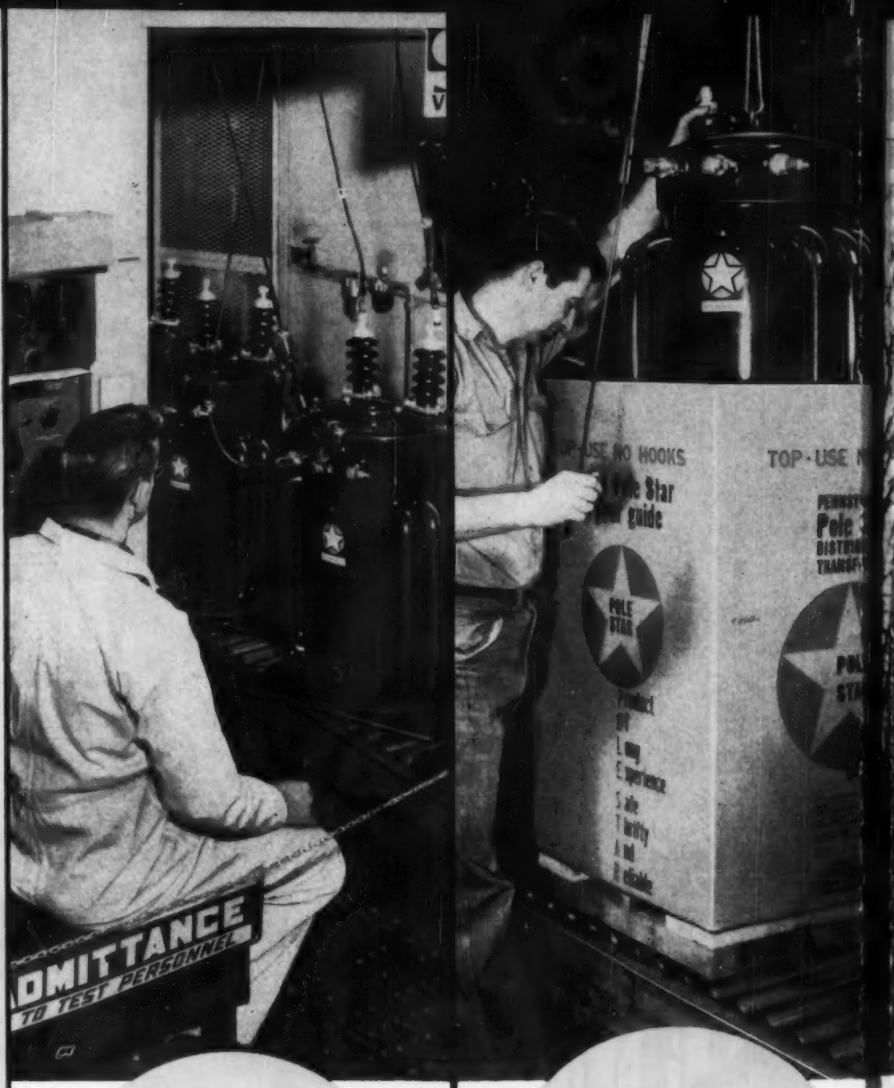
R. G. HALEY CO.
Toledo 4, Ohio

JOSLYN MFG. & SUPPLY CO.
Chicago 6, Illinois

MacGILLIS & GIBBS CO.
Milwaukee 9, Wisconsin

Product innovations and experimental programs...

POLE STAR'S continuous contribution to distribution transformer progress

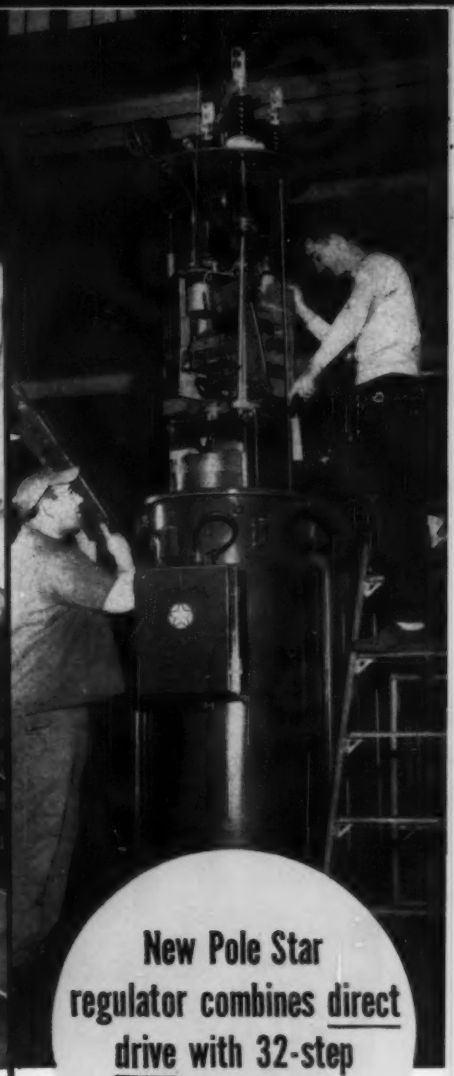


Production-line impulse testing detects even single-turn faults

One of the first manufacturers to begin production-line impulse testing of distribution transformers (in 1956), Pennsylvania Transformer does so with no protective strings attached: that is, Pole Stars are tested *without* arresters. The apparatus used is so sensitive it will detect even single-turn faults. Result: a high-quality transformer is made even better, and purchasers are assured of the greatest possible uniformity of performance.

Perfect Seal Pole Stars are shipped in special corrugated cartons

A double test has been taking place with the shipment of hundreds of Perfect Seal Pole Stars to utilities throughout the country. The completely sealed units—destined for "in service" observation and testing—are being shipped in specially designed corrugated cartons. Advantages of the impact-tested, weatherproof containers—such as better protection, easier disposal and lighter weight—are being carefully checked against customers' experiences and comments.



Pioneer of "higher kva" pole-mounting introduces new 250-kva featherweight

In 1953, Pennsylvania pioneered the pole-mounting of transformers above 100 kva by introducing the Featherweight Pole Star 167-kva unit—an innovation so emulated that industry standards soon were changed to include pole-mounting of 167-kva units. Now, Pennsylvania announces the extension of pole-mounting provisions to 250-kva Pole Stars up to 15 kv. This new Featherweight Pole Star offers the same ease-of-handling features as its 167-kva forerunner.

Experiments with aluminum typify never-ending search for new, better materials

Never content with past accomplishments, Pole Star engineers are constantly searching for even more effective methods, designs and materials. Considerable experimentation has been done, for instance, with aluminum—as a conductor in both oil-immersed and dry-type coils, and as a material for tank covers. Whether measured in terms of later applications or of additional knowledge, the results of such experiments help to assure continued product improvement.

New Pole Star regulator combines direct drive with 32-step regulation

The recently introduced Pole Star Regulator is the only 32-step distribution size regulator that offers a direct-drive tap changer. Based on Pennsylvania's service-proved power-transformer load tap changers, the mechanism features an index-plate method of positioning contacts that assures optimum switching speed, with consequent minimum arcing and extra long life.

PENNSYLVANIA TRANSFORMER DIVISION
McGRAW-EDISON CO.
McGRAW EDISON
CANONSBURG, PENNSYLVANIA
GREATER PITTSBURGH DISTRICT

P&K OUTDOOR LIGHTING REPORT

HOW TO LIGHT UP A YACHT CLUB MARINA

When the Richmond Yacht Club, Staten Island, N. Y., wanted to light their marina, they chose P&K CIRCLElux units for two good reasons. First, these units provided the desired light intensity. They added a big measure of safety to the marina at night. Secondly, the davit style standards were an architectural complement to the facilities. What's more, they'll keep their good looks too. Salt sea air is no problem for the all-aluminum units. They can't rust—they never require painting. It goes without saying that their natural light weight made installation fast and economical.

THERE'S AN IDEA HERE FOR YOU:

For marinas, shopping centers, or any industrial or residential lighting application, P & K CIRCLElux will meet all your requirements. The standards, available in a wide range of styles, and the luminaires, available in fluorescent, incandescent or mercury vapor, mean that you customize any installation with a "packaged" unit. You get both the lighting you need and the architectural beauty you want. Our new brochure LTG-30 will help you. Write for your copy.

P&K PFAFF & KENDALL
84 FOUNDRY STREET, NEWARK 5, N. J.

BRANCH SALES OFFICES: MIAMI, FLORIDA; BURLINGAME, CALIFORNIA
IN CANADA: POWERLITE DEVICES, LTD., TORONTO, MONTREAL, VANCOUVER
EXPORT REPRESENTATIVE: PHILIPS EXPORT CO., NEW YORK, N. Y.

GE Develops Fuel Cell

(*Continued from p* 64)

A number of cells have been operating continuously for 75 to 100 days, and these tests have not yet been concluded. One cell has operated for more than 100 days and is still running. Two cells have been operated with their cathodes exposed to the air; one is still running after more than 75 days. Portions of these tests have been conducted at current densities of 30 ma/cm^2, although most of the operation has been at lower current densities.

Randolph Electric Orders First Rural Aluminum Sub

Randolph Electric Membership Corp is reportedly the first rural electric cooperative to order substation structures made of aluminum. Reasons for the co-op's choice of aluminum were given by Randolph's manager, A. P. Wall, as handling ease and lower maintenance costs. He estimated the use of aluminum will cut installation time 33 to 50% and would require no special handling facilities other than a line truck.

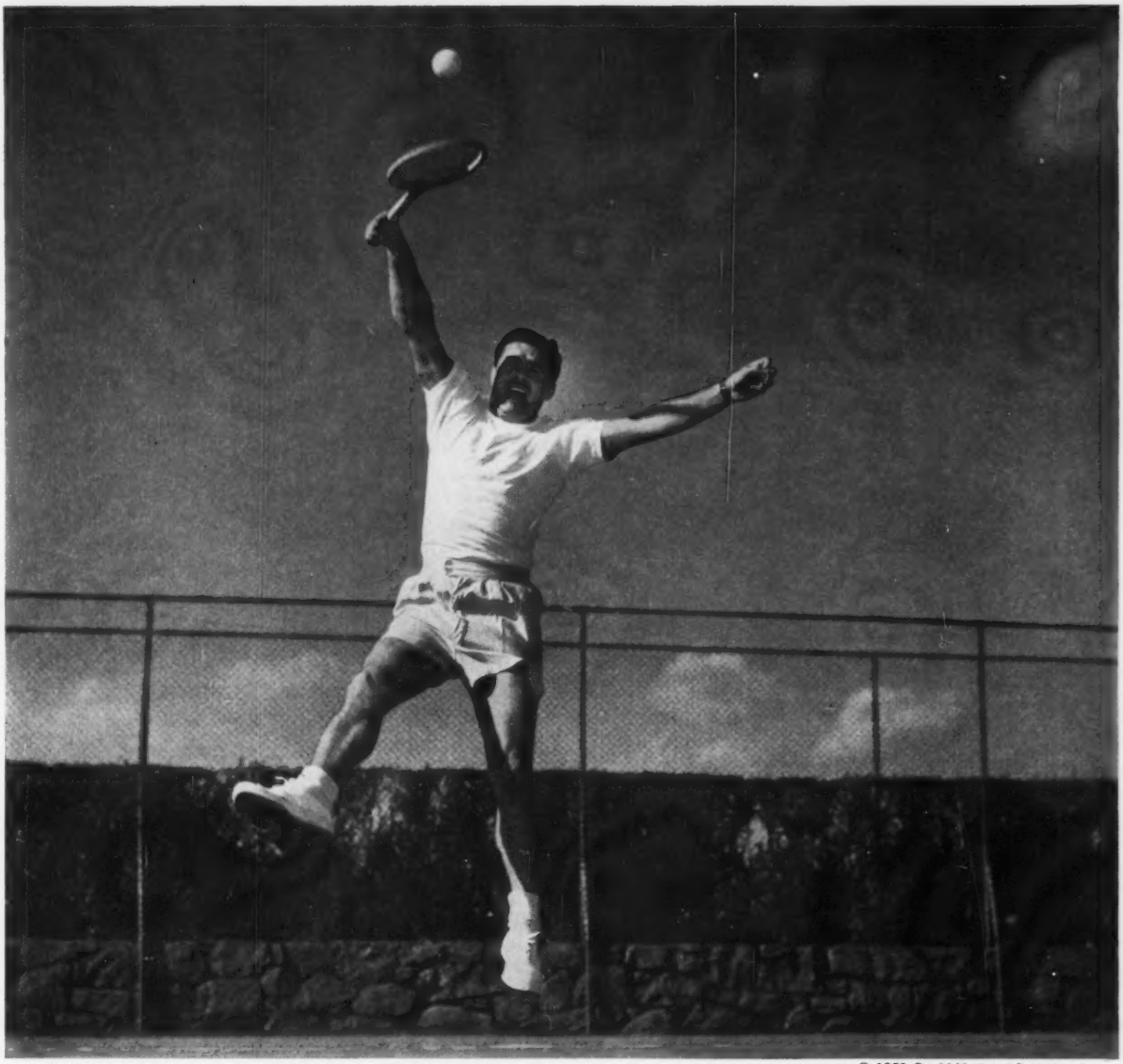
Equipment to be supplied by GE for the four substations being designed and fabricated for Randolph includes regulators, transformers, reclosers, switches, and conducting and insulating material. The consumable electrode method of welding the structures will be used by General Electric's high-voltage switchgear department. Installation of the substations is scheduled for completion by November.

Pittsburgh Standard Enters Aluminum Conduit Field

Pittsburgh Standard Conduit enters the aluminum rigid electrical conduit field, agreeing through an exclusive contract with Olin Matheison Chemical to produce it from raw piping supplied by the latter.

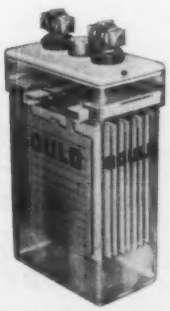
Production is under way at PSC's new headquarters plant in Verona, Pa. Another plant in Morrisville,

(*Continued on p* 70)



© 1958 Gould-National Batteries, Inc.

SMASHING *all records for long battery life...* **gould**



America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

You want the most
for every dollar invested in batteries. Gould can help you.

Batteries get harder use some days, lighter use other days. Operating conditions are seldom constant. Frequent over-discharging and over-charging, which is not recognized and corrected, can seriously harm a battery.

You can avoid this possibility. Assure maximum operating efficiency, lower maintenance costs, and longer battery life, by letting Gould help you establish a simple effective preventive maintenance program for your batteries.

Can't you see how you will benefit from such a program? Call your local Gould representative for details. No obligation. He's listed under "Batteries, Industrial" in the yellow pages. Gould-National Batteries, Inc., Trenton 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

More Power to you from Gould

How to "specify" splices that will last as long as the cable

You can specify "failproof" splices by specifying the same kind of insulation for the splice that you do for the cable.

The compound used for insulating a cable is specifically designed for its job. Therefore, when a portion of the insulation is removed in making the splice, it stands to reason that the insulation should be replaced with the same material—with a true cable-insulating compound.

Fortunately, there are splice insulating tapes made of true cable compounds. They're Okonite and Okolite tapes. Made from fine Para rubber, unexcelled for physical characteristics, Okonite and Okolite tapes fuse into a solid, layerless, non-porous wall of insulation that has excellent moisture resistance, no voids to cause failure, and no adhesives to dry out, ooze, or cause slippage of the tape wrappings. Okonite and Okolite actually become an integral part of the cable's insulation, not a weak "link" in it.

Like to try some of this tape? Let Okonite pay for your first roll. Ask for either or both of the tapes. Just fill in this coupon and send it to Okonite.

The OKONITE Company

Subsidiary of
Kennecott Copper Corporation
Passaic, New Jersey

Dept. EW 6
The Okonite Company
Passaic, New Jersey
Please check one or both.

.....Okonite tape (yellow can—for use up to 2000 volts).

.....Okolite tape (red can—for use up to 35,000 volts).

Name .....

Title .....

Company .....

Address .....

City .....Zone....State .....

Pittsburgh's New Line

(*Continued from p 68*)

Pa., soon will be supplying distributors from coast-to-coast with aluminum conduit, elbows, and couplings in a full range of sizes.

President R. G. McIlroy says the company's prices are competitive with those of basic aluminum producers in the conduit field.

MANUFACTURERS BRIEFS

Preformed Line Products has joined other manufacturers in participating in Pennsylvania Electric's 460-kv line experiment. The company will supply armor grip suspensions, armor rods, and bundled-conductor spacers, assisting also in research and engineering of the project . . . Construction of **General Electric's** experimental 750-kv transmission line was launched with a groundbreaking ceremony near Pittsfield, Mass., May 27 . . . **Hagan Chemicals & Controls** will add a $1¼-million building to research facilities at the headquarters site near Pittsburgh. Providing more than 25,000 sq ft of floor space, it will include an electronics lab devoted to Kybernetes data-processing equipment . . . **Dow Corning Corp** has a new, 900-mile, automatic communications system which cuts in half the time required to process sales and shipping orders for silicone products . . . **Atomics International** and **The English Electric Co, Ltd,** of London, agree to exchange technical assistance in the atomic energy field. Organic nuclear power reactor data will be provided by English and information on manufacture and sale of reactors by AI. Both companies will make reactors and parts. Training of personnel of English in organic cooled reactor technology is part of the alliance . . . **Anchor Metals** of Hurst, Tex., has merged with **D. S. Kennedy** of Cohasset, Mass., and will operate as a division of Kennedy, which up to now has developed and made micro-wave antennas exclusively. Anchor manufactures transmission towers . . . **Multi-Amp Electronic Corp** is the new name for Multi-Amp Corp, manufacturer of a line of low-voltage test sets for current and voltage actuated protective devices.

NEW ¾-ton Pull-A-Way
Added to WRIGHT TYPE "C" LINE!

FOUR SIZES • ¾, 1½, 3 and 6 Tons

FEATURES
- Lubricated for life
- Hooks are drop-forged
- Special alloy-steel chains
- Chain sheaves of drop-forged alloy steel
- Gear teeth cut to precision limits
- Load brake is dependable and safe
- Weights: ¾-ton, 14 lbs. 1½-ton, 23½ lbs. 3-ton, 36½ lbs. 6-ton, 63 lbs.

New 3/4-ton model
• VERSATILE
• LIGHTWEIGHT

ACCO

Write to York, Pa., office for complete information

Wright Hoist Division
AMERICAN CHAIN & CABLE
York, Pa., Bridgeport, Conn.

To the man on the route slip . . .
. . . the $6 you save —Is it worth it?

- Stacks of dog-eared copies piling up on your desk . . .
- The risk of missing something you should know about today . . .

Your name, residence address, title, and company on a post card will bring 52 weekly issues of Electrical World directly to your home. You can pay the $6 later. Address: Electrical World, Dept H-2, 330 W. 42 St., New York 36, N. Y.

Whether a Winch Line Hook or a complete Line Body check your requirements with

UTILITY TOOL & BODY CO.
CLINTONVILLE, WISCONSIN
UT&BCo

For uniformly good connections...

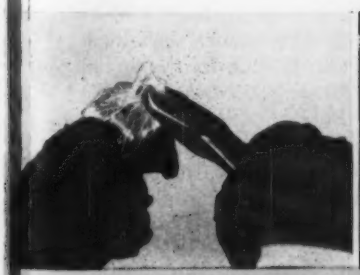
Chance PG Clamps now have a steel hex head bolt so lineman can apply them with two wrenches, without distorting the conductor. Clamp bodies are extra strong in the areas where strength is important, yet have the proper resiliency to handle thermal movement. These clamps contact all outside conductor strands to give a good high conductivity connection.

...let your linemen install CHANCE PG CLAMPS

Your linemen will just naturally make uniformly good, troublefree connections when you supply them with Chance Parallel Groove Clamps. Hex head bolts and extra strength permit two-wrench application without clamp or conductor distortion. Packaged clamps eliminate the need for the lineman to apply contact aid to the clamp itself and a reminder tape on the package tells him to wire brush and apply contact aid to the conductor. All purpose AGP Clamps, when used on bimetal connections, eliminate checking to see which side has the copper insert ...you get a good connection either way.

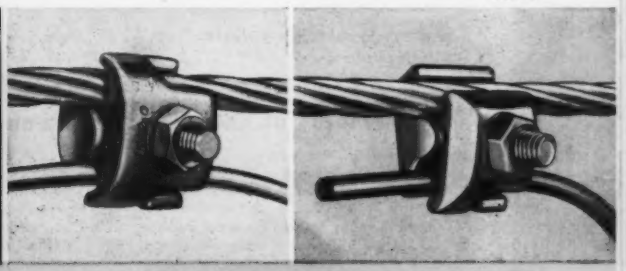
They are available as shown for standard service, and in 2-bolt and 3-bolt types for heavy service connections.

CC59-8



Clamps are available in individual plastic packages with z.l.n. 100 Contact Aid preapplied. Clamp stays clean—lineman is reminded to prepare conductor to protect your circuit. Package is easily opened with lineman's pliers.

Chance PG Clamps are engineered for quick, safe installation. Linemen can apply the Series 100 clamp without touching the conductor or bridging the gap between conductor and jumper with the hand.



Two Designs—Two Types. PG 200 Series has fingers that interlock around main line and tap line. PG 100 has a wide jaw for the main line, interlocking fingers for the tap line. Type "AA" has uncoated aluminum body—"AGP" has heavy fortified cadmium coating for use with all conductor combinations.

A. B. CHANCE COMPANY CENTRALIA MISSOURI

A. B. Chance Co. of Canada, Ltd., Toronto

List of Members of The Advisory Council for Project EHV

1) Members of Edison Electric Institute Task Force on E-H-V Transmission

Name	Title	Company
L. R. Gaty, Chairman	Vice President, Research and Development	Philadelphia Electric
W. S. Price	Electrical Research Engineer	American Electric Power
W. R. Johnson	Chief Electrical Generation and Transmission Engineer	Pacific Gas & Electric
L. F. Lischer	Protection Planning Engineer	Commonwealth Edison
E. R. Moore	Engineering Manager	Detroit Edison
L. M. Robertson	Chief Electrical Engineer	Public Service of Colorado
E. A. Rothfus	General System Planning Engr.	Ohio Edison
J. H. Vivian	Chief Electrical Engineer	Southern California Edison
C. K. Poarch, Secretary		Edison Electric Institute Headquarters

2) Representatives of U. S. and Canadian Public Power Groups

E. C. Starr	Chief Engineer	Bonneville Power Administration
E. L. Kanouse	Design and Construction Engineer	Dept. of Water & Power City of Los Angeles
K. E. Hapgood	Assistant Director, Power Engineering & Construction	Tennessee Valley Authority
H. M. Ellis	Supervisor, Electrical Research	British Columbia Electric
J. J. Archambault	Assistant System Planning Engr.	Quebec Hydro Electric Commission
J. H. Waghorne	Senior Research Engineer	Hydro Electric Commission of Ontario

3) Representatives of the Participating Companies

L. Wetherill	Manager—Engineering, Power Transformer Dept.	General Electric
W. J. McLachlan	Manager—Engineering Planning and Development, User Industries Sales Department	General Electric
V. L. Cox	Manager—Laboratories Dept., Switchgear Div.	General Electric
P. A. Abetti	Manager—Project EHV, Power Transformer Dept.	General Electric
C. B. Lindh, Secretary	Development Engineer—System Design & Performance, Project EHV	General Electric
M. G. Moses	Chief Engineer	Western Massachusetts Electric
P. T. Coffin	Manager—Electrical Industry Sales	Aluminum Co. of America
H. Miller Walton	Product Manager	American Bridge Div, U. S. Steel
R. M. Wood	Construction Manager	Stone & Webster Engineering Corp
E. E. Hockaday	Industrial Product Sales	Rilco Laminated Products, Inc. and Weyerhauser Timber Co.
S. A. MacMullan	Manager — Sales & Engineering	Anchor Metals, Inc.
G. A. Petersen	President	Petersen Engineering Co.

Members of Consulting Engineers Committee

Name	Title	Company
J. E. Barkle	Asst. Chief Electrical Engineer	Bechtel Corp.
P. L. Bellaschi	Consulting Engineer	P. L. Bellaschi
O. E. Charlton	System Electrical Engineer	Southern Services, Inc.
J. O'R. Coleman	Project Engineer	Stone & Webster Engineering Corp.
J. H. Foote	Chief Engineer	Commonwealth Associates, Inc.
J. C. Hitt	Electrical Engineer	Jackson & Moreland, Inc.
J. P. Kesler	Head-Elec. Design Department	Black & Veatch
T. O. Millard	Chief Electrical Engineer	Pioneer Service & Engineering
R. E. Moran	Electrical Engineer	Charles T. Main, Inc.
E. G. Norrell	Chief Electrical Engineer	Sargent & Lundy
A. H. Phillips	Chief Electrical Engineer	Gilbert Associates, Inc.
S. B. Smith	Electrical Engineer	Ebasco Services, Inc.

Project EHV Begins

(*Continued from page* 49)

ous types of steel, aluminum, and laminated wood will be tested. Structures will be of the corset, H-frame, and guyed types. One configuration will be continued for nine or 12 months, and the same configuration will be used again on the short section, so that the effect of line length can be studied. There will be three separate lines available for testing:

1. The 0.65-mile section energized from the North Station.

2. The 3.65-mile section energized from the South Section.

3. The entire 4.3-mile line energized from either end.

Conductors to be investigated at 460 kv include: One special, 2.32-in. OD, 2,850-MCM; two Plovers (1.4650-in. OD); and, three Cardinals (1.19-in. OD) per phase, spaced 18 in. apart. At 650 kv. three Plovers and four Cardinals per phase will be tested. The long section is designed for standard heavy loading, ½-in. ice; the short section for 1-in. ice. The North Station will have both aluminum structures and aluminum buses for the 650, 115, and 23-kv sections. Most station apparatus will be of advanced design.

The system will be operated open ended at 400 to 550 kv, mostly at 460 kv, during the first year; and, during the second year at 550 to 750 kv, mostly at 650 kv. It will be operated during the third year as an integral part of the Western Massachusetts Electric Co system at 650 kv. Thus, as the predicted future steps in EHV transmission will be adequately bracketed, Project EHV results can be correlated with those obtained on Europe's 400-kv lines and on experimental lines, such as the Tidd project of American Electric Power Co, the Leadville project of Public Service Co of Colorado, the Coldwater project of Ontario Hydro-Electric Commission, and the recently announced 460-kv prototype line of Pennsylvania Electric Co.

As EHV apparatus and technology concern many separate components of GE, a single department will integrate Project EHV activities. As power transformers are a large item of EHV system investment, the Power Transformer De-

partment, Pittsfield, Mass., will manage the project. This department operates the High-Voltage Laboratory, traditionally the GE main center of high-voltage research. As Project EHV involves products and services besides those normally available within the company, manufacturers of conductors, towers, and other items will furnish products and services on a cooperative basis.

Western Massachusetts Electric Co was the obvious choice as the power source and for cooperating in design and operation. There are 16 GE components and six other cooperators. The author heads a new Power Transformer Department subsection for managing the project. The Project EHV staff is small, each engineer having been assigned to a somewhat wide area of technical work, which is nevertheless sufficiently manageable for him, as an expert, to advise colleagues, participants, and customers in all aspects of his field of activity.

In general, laboratory or design work is done by cooperators responsible for equipment, or by the HV Laboratory. Project personnel and cooperators must agree on specifications, and product departments must meet them. About 25 people work full time, about half in Pittsfield.

As practically all technical problems to be investigated are of immediate interest to them, utilities are taking a leading part in determining the nature, scope, and timing of the investigations. At GE's request, the Edison Electric Institute named an Advisory Council for the project. The EEI also appointed an Interim Task Force on EHV Transmission, with L. R. Gaty as chairman. The final EEI Task Force consists of prominent engineers from eight major American utilities.

GE has also asked three representatives from U. S. government-owned utilities and three from the Canadian utilities, both groups not represented in EEI, to join the Advisory Council.

Since consulting engineers also have a great interest in EHV transmission, a separate Committee of Consulting Engineers on Project EHV, consisting of 12 members was established. The first meeting took place in Pittsfield on May 27, at the time of ground breaking.

CONTINENTAL ASBESTOS-INSULATED
POWER CABLE

***TYPE AVA TO 5000 VOLT SERVICE** available sizes: 14 AWG to 1,000,000 CM inclusive. Conforms to N.E. code standard and NEMA standard WC1-1955 and ASA C8.-36-1955.*

Engineered insulated wire and cable from Continental Wire assures maximum Job-Dependability.

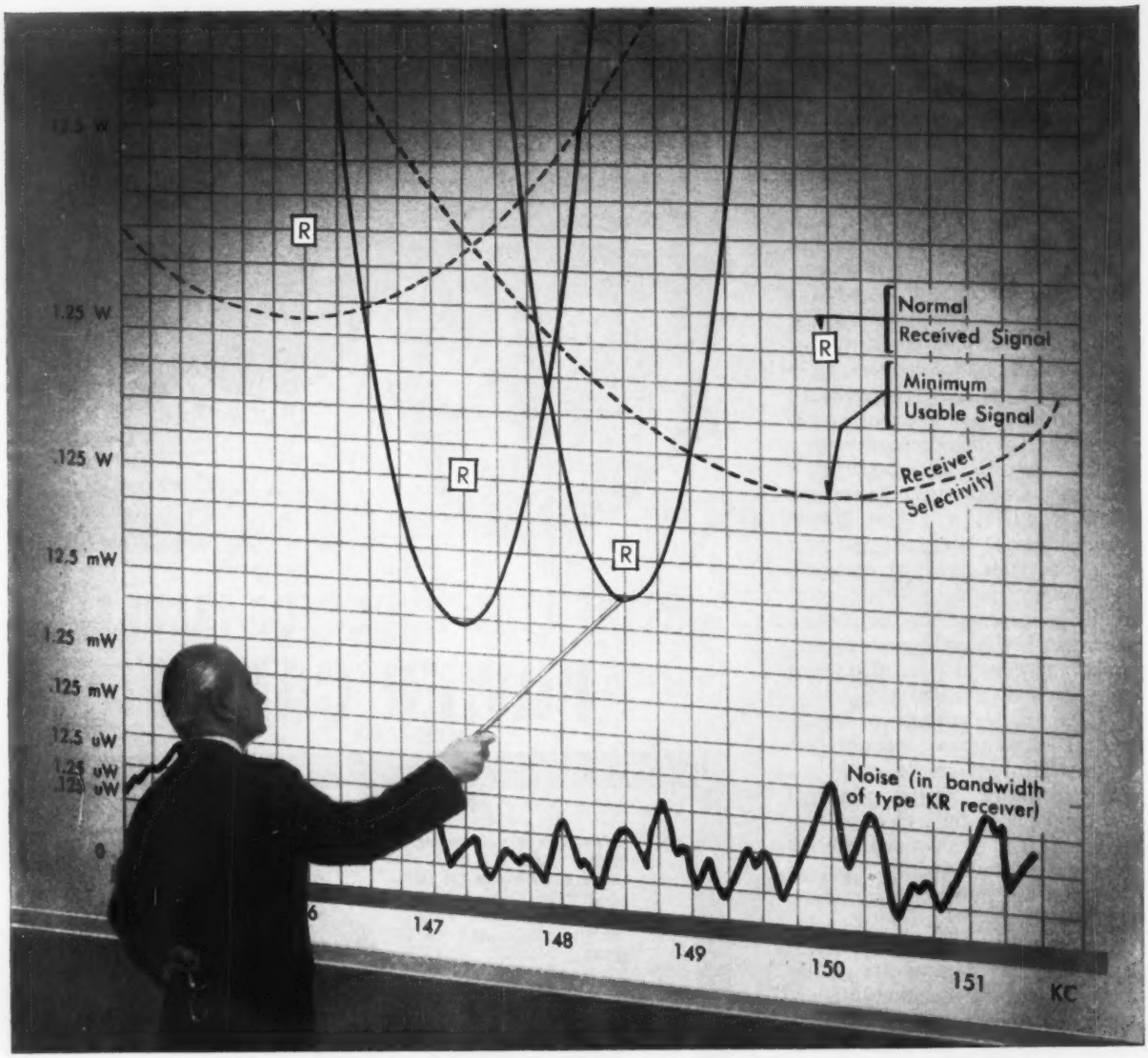
Type AVA Power Cable is recommended for use in open or in conduit installations where advantages of excellent current carrying capacity and resistance to high temperature are desired . . . and where operating conditions include oil, grease, corrosive vapors or moisture.

There's a complete line of Continental Insulated Power Cable in sizes 14 AWG to 1,000,000 CM inclusive . . . insulation types include AVA . . . AIA . . . V . . . AVB . . . Silicone Rubber . . . Glass . . . Teflon Tape . . . and Varnished Glass Tape.

For more information write Continental, Wallingford.

continental wire corporation

WALLINGFORD, CONNECTICUT • YORK, PENNSYLVANIA



DOUBLE YOUR POWER-LINE CONTROL CIRCUITS WITH WESTINGHOUSE KR CARRIER

The above spectograph section illustrates how two additional control channels can be added within the crowded frequency spectrum of existing high-wattage power-line carrier equipment. Type KR carrier meets a real need today of utilities faced with a growing density of control functions on tightly interconnected primary transmission systems.

Much greater selectivity of the Westinghouse receiver permits the assignment of new channel frequencies nearer the old ones. Improved frequency stability of the KR transmitter also reduces the possibility of interference of signals with the old equipment. This combination permits the use of lower power transmitter output . . . just 1.2 watts for Westinghouse KR carrier.

It can also be observed in the above spectograph that the KR's output provides a very generous margin of safety above the average High-Line noise level.

Another Bonus Value of Westinghouse KR carrier is the exclusive use of transistors. Transistors eliminate tube replacement, reduce battery requirements 90%, cut heat radiation by 90%, and provide a unit that can be mounted on the relay switchboard . . . in 1/20 the space of other carrier equipment.

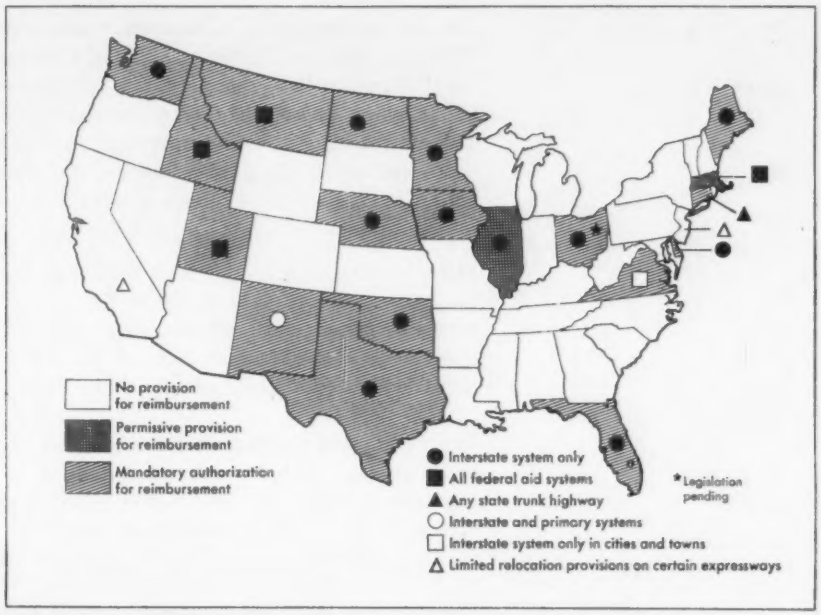
For more details about Westinghouse KR carrier —proven in five years of field experience—write for a copy of booklet B-7611 to:

Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60970

YOU CAN BE SURE...IF IT'S

Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS


No provision for reimbursement
Permissive provision for reimbursement
Mandatory authorization for reimbursement
Interstate system only
All federal aid systems
Any state trunk highway
Interstate and primary systems
Interstate system only in cities and towns
Limited relocation provisions on certain expressways
*Legislation pending

Report on
Relocations and Right of Way

Varied approach to utility reimbursement helps push a . . .

Deadline on Relocation Problems

Utilities are feeling a bigger bite from federal highway bulldozers. Aside from the engineering and system planning challenges, the $101-billion highway program poses a complex set of problems for the men whose job it is to acquire and pay for electric utility rights of way and land. And, judging from some recent developments, the bulldozer's bite is going to cut deeper for those systems along the roadway.

The highway program already has challenged some traditional concepts on the rights of roadway occupancy by utilities. There also is a growing measure of disenchantment for reimbursing utilities when a new highway necessitates relocation of their facilities.

The states' hodgepodge treatment of relocation reimbursement, shown above, reflects the trend. Four years after passage of the Federal Highway Act, only 18 states have passed laws that make them eligible to receive federal funds to help cover utility relocation cost. These states put up 10% of the cost and the federal government supplies 90%. In many instances the battles to achieve the enabling state legislation opened wounds that haven't healed yet.

Four of these states' lower courts have upheld reimbursement laws. These decisions, however, have been appealed to the supreme courts of Idaho, Montana, North Dakota, and Texas where rulings now are pending. New Mexico's newly-enacted law is expected to be appealed to the state supreme court, which declared that a previous law was unconstitutional. Reimbursement legislation is pending in Ohio.

Six states have had reimbursement laws vetoed by governors: Colorado, Kansas, New York (once in 1957 and again in 1958), Pennsylvania, Rhode Island, and

Wyoming. Eighteen other states have had bills introduced but the measures failed to gain legislators' approval.

Late last month the U. S. Supreme Court acted on the matter. The high court refused to review a Tennessee Supreme Court ruling that barred use of the state's funds to pay its 10% share of utility relocation cost. In effect, the U. S. Supreme Court action upheld the Tennessee court's ruling that the law authorizing the 10% payment was invalid under the state constitution. The law could not be supported as in the public interest, the state court held, since the measure authorized payment of money primarily for the "convenience and benefit of private utilities."

Memphis Transit Co argued that the state court ruling amounted to taking of the firm's property in violation of the federal constitution. The company said the presently planned interstate highway system in and around Memphis will cross 30 of its 33 transit lines at 31 different points. This will involve an estimated relocation cost of over $800,000 for the company.

The U. S. court's action dims the prospect for reimbursement laws, it appears, in those states lacking such legislation. It is conceivable that the action also jeopardizes some of the laws now in effect. It definitely pushes forward the deadline for a practicable working arrangement between highway planners and affected utiliites.

Coupled with this setback is the adamant position of highway people. "A true dyed-in-the-wool highway man holds the view that there is no sound basis for questioning the sanctity of highway funds," a University of Michigan professor told a chapter meeting of the American Right of Way Association last month. John C. Kohl, who also is director of the Transportation Institute, reminded the group of President Eisenhower's recent warning of highway spending cutbacks if added funds are not provided by new taxes. As for Michigan, "Our highway funds are committed and must depend on continued federal aid. Any holding back means curtailment, delay and waste. Every penny spent on utility reimbursement is a penny lost to the cause of urgently needed roads, it is claimed with some justification."

Three factors tend to work against utility arguments for reimbursement on relocations caused by the new highway program, Prof Kohl said:

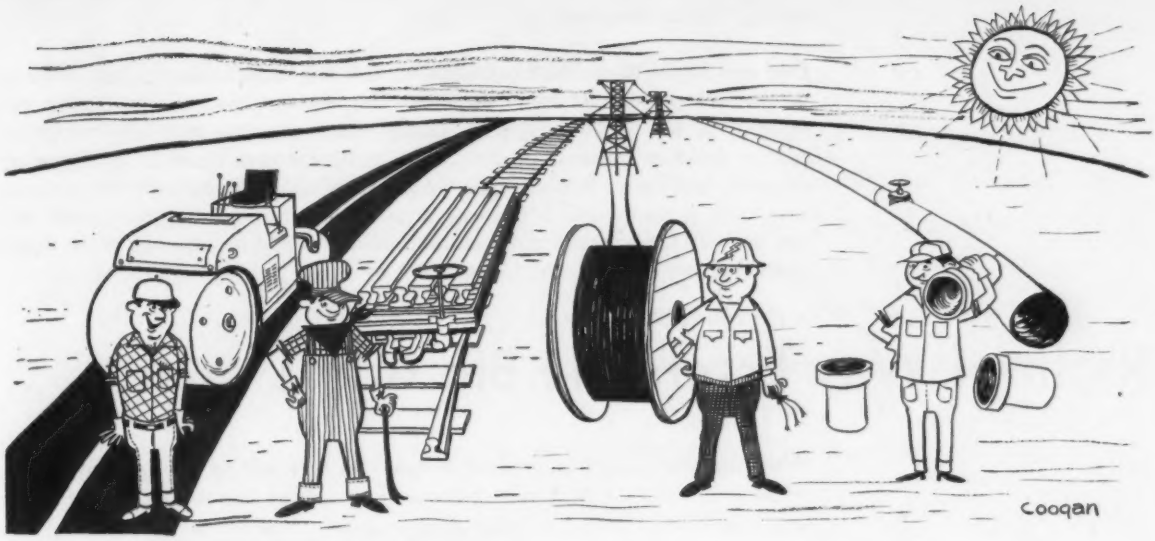
1. Equal use of roadways by utilities in the past usually was granted without charge. The free rights of way provided at public expense "was not a vested right, but a sufferance, it is held."

2. With more than 65 million motor vehicles on the roads—a total exceeding, for example, telephones in use or the number of households—it poses the question, "Why burden the more with the load of the fewer?"

3. Today, the modern highway is "as highly specialized as the railroad in serving a new transport function." It is a function far removed from local streets that primarily provided access to land and property, and one which might bring "new rules defined in the public interest," he said.

Utilities contend only $1½ to $2 billion is needed for relocation expenses, Prof Kohl said. This amounts to less than 2% of highway program. The "why quibble about peanuts?" argument has been blunted, he said, by the current state of the Highway Trust Fund, which "is not receiving highway user tax income fast enough to maintain the projected construction program. Costs, too, are running much more than estimated."

The question, "Who pays?" ultimately will be answered by lawyers, the professor said. Until the answer comes, he urged the utilities and highway agencies to "agree on principle and to maintain close liaison to avoid sheer chaos of delay."



Prospects brighten with the progress on . . .

One Answer: Better Liaison and Planning

Some individual utilities and highway agencies have found teamwork pays. Effective liaison in a few states has proved mutually beneficial on not only the new federal highway program but on state and local thoroughfares as well. But it's only been in the past year that concrete steps have been taken on a national level which offer promise of filtering down.

"There is as much to be gained by advanced planning, as by reimbursement." This is the view of Sam Houston, former American Right of Way Association chairman and a telephone company man. This is shared by ARWA's one-year-old National Liaison Committee, headed by Detroit Edison Co's Richard H. Taylor, which has set up channels of communication that both utilities and highway agencies can use to resolve mutual problems on the basis of long-range planning, cooperation and coordination.

Here's how the teamwork pays off. Taylor, who is Detroit Ed's director of real estate and R/W, told a regional ARWA meeting earlier this year of the setup in his region. Under the auspices of the ARWA chapter, a utility committee has been formed to consider, among other things, local highway liaison. "The state highway department has appointed a utility engineer who will coordinate all contacts between the various departments of the state highway and all public utilities relative to the relocation of facilities necessitated by widening, relocation or new road construction," Taylor said.

Each of the big utilities appointed a man to coordinate the flow of plans and schedules between the utility and the highway department. This man follows individual jobs and is responsible for teamwork and scheduling for his utility and the highway agency at job levels. He handles unusual problems with the proper highway department section, as designated by the highway utility engineer.

The highway department has furnished its advance program for five years to the utilities, Taylor said. "Preliminary plans will be discussed in the field with utilities involved at least six months in advance of letting bids. However, it is hoped this lead time can be increased even beyond one to two years."

Already, the arrangement is providing a better flow of information, better understanding of mutual problems, will result in fewer utility relocation delays, and,

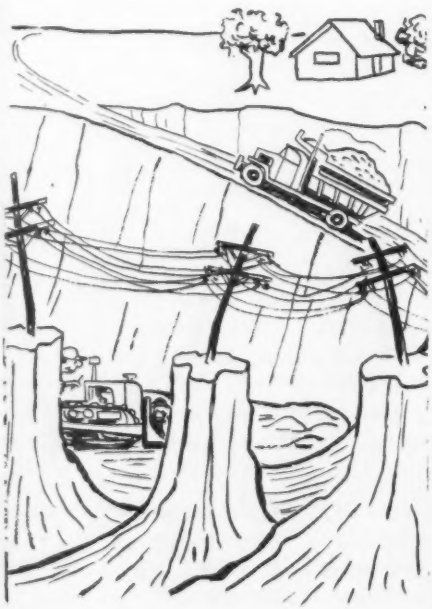
"in many instances, less expensive relocation costs to both the state and the utility," Taylor observed.

One sure way to foster the liaison and the resulting economies would be to assign costs of relocation to highway agencies. This is a step advocated by Taylor, one which Prof Kohl mentioned in his talk. "With such costs as a fully recognized part of highway construction cost, more comprehensive location studies would be made and better consideration be given to utility problems," the professor said. "No longer would a highway department refuse to consider a shift of a few hundred feet to avoid major utilities; utilities would become one of the design controls."

Right of Way Enters the Big Arena

When the talk touches on costs of $10,000 an acre and up for rights of way, as it did at the ARWA St. Louis utility section meeting last month, the pursuit of land acquisition enters the arena of big business. The impact of mounting land values received the major attention of electric utilities represented. And the degree of impact is typified by an easement, secured in this instance by a telephone company, costing about $3,000 an acre for desert land near Palm Springs where sun-happy Californians are settling.

The basic approach to reduced R/W costs was outlined by L. D. Gray, Louisville Gas & Electric Co. His recommendations: **1.** Get enough rights in the original agreement to cover future uses of R/W. **2.** Make sure the R/W is wide enough for added burdens. **3.** Plan and acquire it in advance. **4.** Secure multiple rights; i.e., for underground as well as overhead use. **5.** Save labor costs by clearing R/W from edge to edge, including danger trees. **6.** Pay more to get a reliable contractor who can justify the added fee by saving on excessive damage claims.



Snafus can stem from loosely-drawn easements. A Massachusetts utility found itself in a bind on maintenance costs because a pole-line easement didn't prohibit encroachment of a sand and gravel firm. The line ended up about 50 ft above surrounding terrain. Now the utility buys 325-ft R/W outright and accepts tax handicaps to secure absolute land-use control.

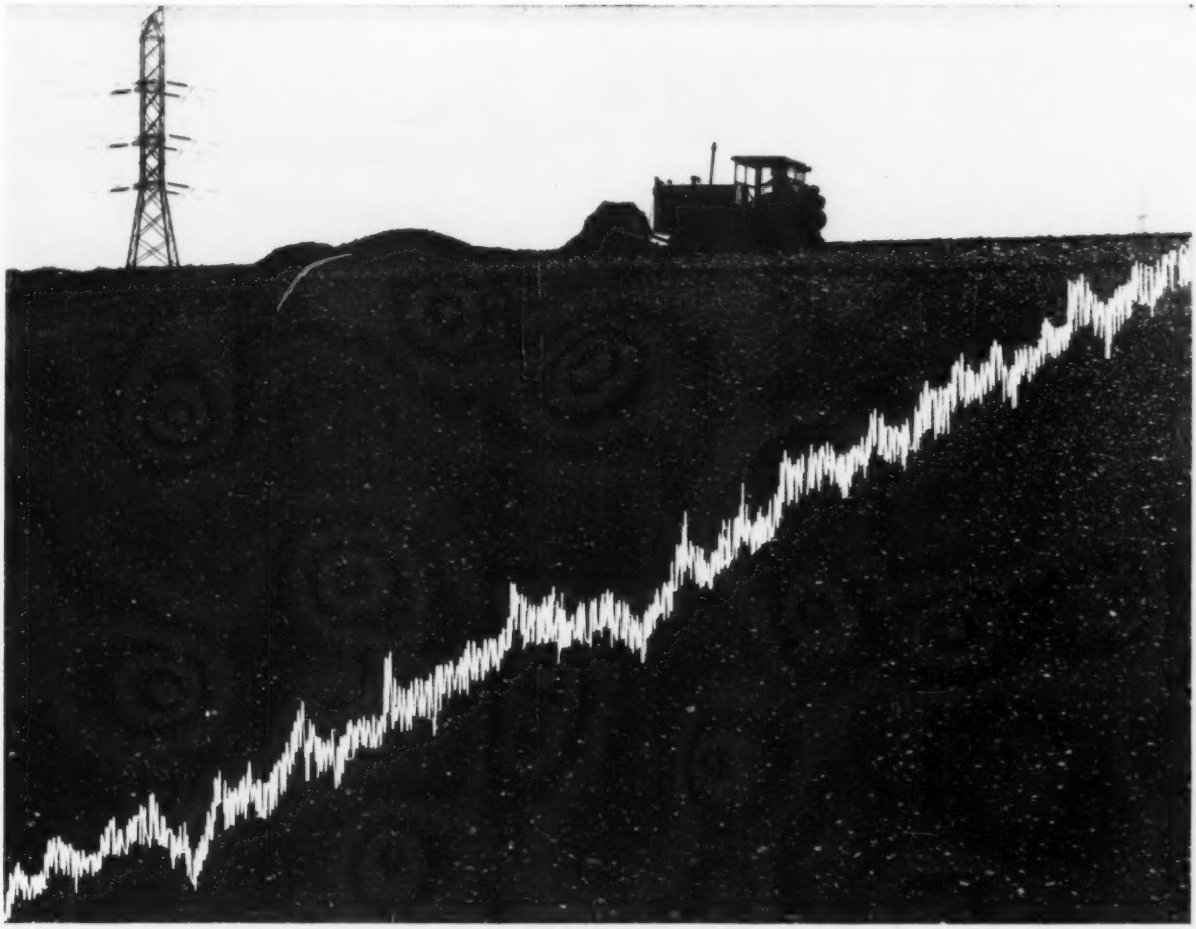
If the advantages of an easement and fee simple title could be combined, one delegate suggested, utilities could have a document that provides the permancy of outright ownership plus the depreciation and tax advantages of an easement running to perpetuity, and the distributed payment feature of a lease. Potomac Electric Power Co has ventured into this area with a "qualified fee title" (EW, March 24, 1958, p 71).

A prudent balance between growing generating capacity and dwindling transmission reserve is possible with extra-high-voltage transmission, Dan Braymer, senior editor of Electrical World, told the group. But conservation of existing R/W is needed as urgently as EHV, he said. The two must go hand-in-hand if utilities are to make today's crowded, high-priced R/W yield a greater return.

EHV and uncertainty over future needs has occasioned wider R/W widths. New York State Electric & Gas Corp has acquired in fee some 25 mi of R/W 500-ft wide; in some sections, 1,000 ft. Problems are extending to air rights, too. Bonneville Power Administration has secured easements for microwave beam paths and another utility bought the right to clear trees for its microwave beam. As for payment policy, New Englander R. E. Smith, emphasized equal amounts to property owners, and a generous offer—usually a fair price plus 20%. Smith added that each owner is shown the checks his neighbors will get.

powerful appetite!

As utilities *look* ahead and *build* ahead for a power demand in ten years double what it is today—continuity of supply and proven, available coal reserves are topmost subjects in discussions with their suppliers. A career coal company such as Island Creek with its vast reserves,* modern mining methods and scientific preparation facilities is in a position to come up with some very reassuring answers. We'd welcome an opportunity to do some looking ahead *with you.*



* *Island Creek's vast, proven, available reserves total more today than Island Creek has taken out of the earth in the past 50 years.*

You can depend on **ISLAND CREEK**

. . . a career company . . . dedicated to coal

Island Creek Coal Sales Company, Chafin Building, Huntington 18, West Va. • Cincinnati • Cleveland • Greensboro • Chicago • Detroit • New York • Pittsburgh

After 10 years of service, Gulfcrest oil still

In December 1948, Florida Power & Light Company at their Cutler plant put into operation the first two of six turbine-generators with a total capability of 400,000 kw. All six units were filled with Gulfcrest—the long-lasting, anti-rusting, non-foaming turbine oil. The Cutler plant uses Gulf lubricants exclusively.

Ten years later, after a total of 350,400 turbine operating hours, samples of the oil showed it to be well within the original formulation specifications . . . surprisingly close to the specifications for new oil.

Laboratory analyses of the Gulfcrest oil showed:

	ORIGINAL PROPERTIES	AFTER 10 YRS. SERVICE
Color, NPA	1¼	1½
Flash point, °F.	410	420
Appearance	Clear	Clear
Water, % by volume	0	0
Viscosity, SSU at 100°F.	151	153.2
Neutralization	.04	.04
Interfacial tension, dynes per cm at 77°F.	24	31
Steam emulsion number	100	105
Rust prevention test, 24-hr. distilled water	Bright—passes	Bright—passes

Proof by color. After 10 years of service, samples of Gulfcrest showed NPA color rate of 1½—one of many proofs that the oil hasn't deviated from its original characteristics.

Gulf representative J. S. Bailey, right, discusses general operations with an official of Florida Power & Light Company.

Outdoor power plant. Florida's mild weather makes possible this unusual outdoor installation where Gulfcrest lubricates all six turbines.

within original specifications . . .

This plant can expect many additional years' service from this oil without marked change from present analysis. In many large turbines Gulfcrest has served continuously up to 20 years with neutralization numbers still low, systems still free from sludge and rust.

Every performance record of Gulfcrest proves that Gulf makes things run better. Small wonder that in Gulf's marketing area, more power is generated by central station steam turbines lubricated with Gulfcrest than with any other oil.

More information? Write for illustrated booklet.

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF MAKES THINGS RUN BETTER!

SP-9470

Traction motors take 1000 volt jolt underwater at National

The Specialists in electric coils... repair / service

National Electric Coil now rewinds traction motor armatures with NECCOBOND coils and vacuum impregnates in Epoxy resin. This combination offers you longer life and more dependable motor service because of these reasons:

- high thermal stability
- outstanding electrical properties
- cooler operating temperatures
- excellent mechanical strength
- inertness to water, chemicals, greases.

So effective is the National system that both field coils and armatures pass a 1000 volt d.c. test while immersed in water. Several armatures have been left underwater several weeks without a significant reduction in insulation resistance.

If you want the kind of superior performance that this insulation system makes possible, contact National for your renewal or modification needs.

For more information call National's Columbus plant... HUdson 8-1151, or call the nearest National field engineer.

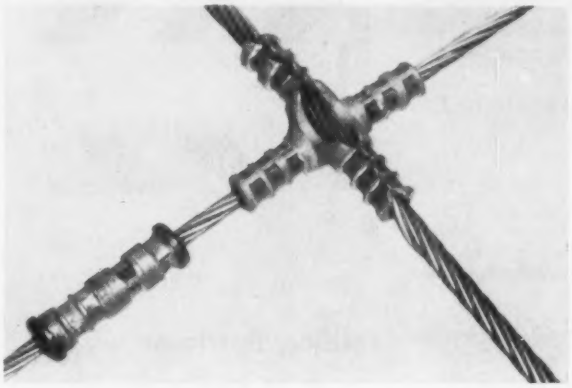
National Electric Coil

DIVISION OF McGRAW-EDISON COMPANY
COLUMBUS 16, OHIO

McGRAW EDISON

ELECTRICAL ENGINEERS • MANUFACTURERS OF ELECTRICAL COILS, INSULATION, LIFTING MAGNETS • REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

(For further information refer to Reader Service on page 85)



Compression X-Taps . . .

. . . are designed for mid-span tapping where opposite right-angle service taps are required. By leaving the end of a single tap projecting from the X-tap, an opposite-side tap can be easily made later. X-taps, available in six sizes, give a main-line conductor range of No. 4 ACSR or No. 2 solid through No. 2 ACSR; a tap-line range of No. 6 ACSR or No. 4 solid through No. 2 ACSR. They can be applied with any compression tool that has a ⅝-in. diameter groove.
A. B. Chance Co, Centralia, Mo.

DC Motor . . .

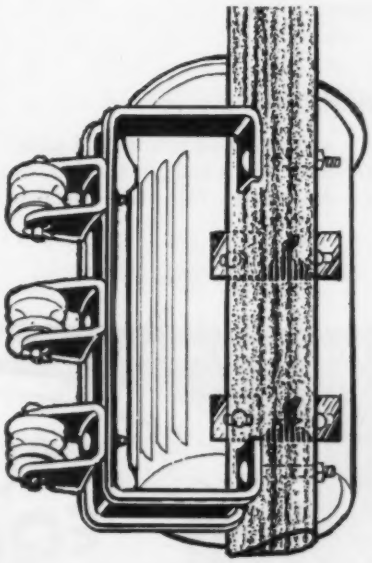
. . . features water-to-air heat exchanger. The explosion-proof motor, an addition to the Kinamatic line, is available with ratings from 40 to 150 hp and speeds up to 6,000 rpm. The water-to-air heat exchanger is more efficient than the air-to-air model, permitting reduction of overall motor size.
General Electric Co, Schenectady 5, N. Y.

Portable Radiophone . . .

. . . is designed to block out interference by other radio systems on a user's channel. Called "Private Line" radio, the "Handie Talkie" two-way unit provides same tone-coded squelch protection as the company's "Private Line" mobile and base station equipment. It is available in low and high powered versions in both 25-50 mc and 144-174 mc frequency bands.
Motorola, Inc, Communications and Electronics Div, 4501 W Augusta Blvd, Chicago 51, Ill.

Anchor . . .

. . . is designed for fast installation in machine-drilled holes. The heavy duty, self-sealing dome-plate anchor is light in weight and easy to transport. The self-sealing feature, with four corners of the plate digging into the soil, offers resistance to creeping or skiing up the side of a vertical hole. The anchor is designed for heavy distribution and transmission structure guying.
Pieper-Lillard Div, Jasper Blackburn Corp, 1525 Woodson Rd, St. Louis 14, Mo.



Extension Bracket . . .

. . . keeps wires clear of transformers. Hot dipped galvanized channel, $\frac{3}{16}$ x $\frac{9}{16}$ x 2 in. sets secondary bracket out 12½ in. from pole to center of porcelain.
Thiel Tool & Engineering Co, Inc, 1417 N Market St, St. Louis 6, Mo.

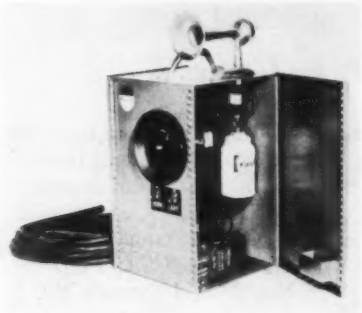
Traffic Alarm . . .

. . . has both flashing light and warning horn. The horn is triggered when a vehicle overrides the light and runs over an air hose placed ahead of a closed lane. A box 10 x 10 x 15 in. high houses the light, a standard lantern battery

(*Continued on page* 84)

Traffic Alarm . . .

(*Continued from page* 83).



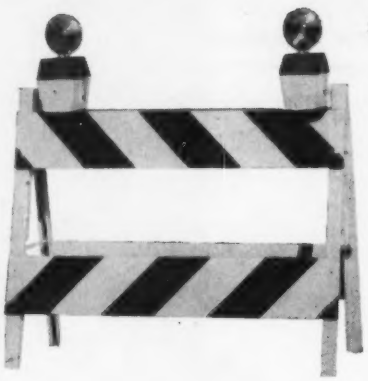
by which the light is powered, and the horn mechanism, including a replaceable can of Freon.
Falcon Alarm Co, 243 Broad St, Summit, N. J.

Herbicide . . .

. . . controls most annual and many perennial weeds and grasses. Known as Prometone 25E, the chemical appears especially promising for control of Johnson grass and Bermuda grass. It is most effective when applied within two to three months following weed emergence and when there is adequate rainfall to move the chemical into the root zone.
Geigy Agricultural Chemicals, Box 430, Yonkers, N. Y.

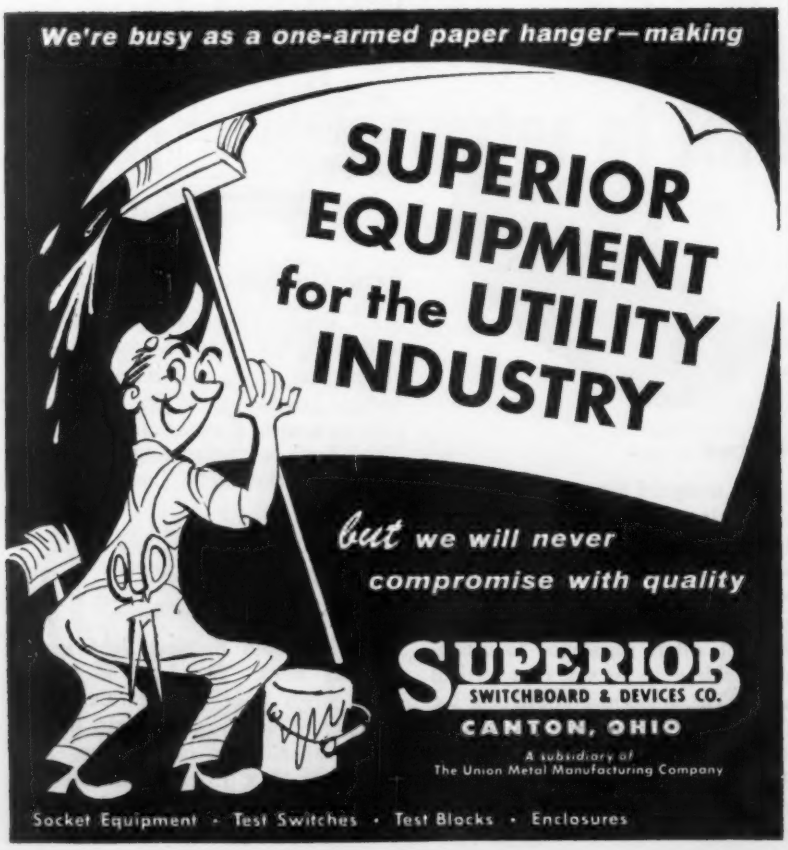
Cutting Plier . . .

. . . has extra high leverage to do many of the jobs too tough for a conventional oblique cutter to handle. "Handform" handles assure greater ease and comfort in cutting. The 8-in. plier is Cat. No. 228-8.
Mathias Klein & Sons, 7200 McCormick Rd, Chicago 45, Ill.



Folding Barricade . . .

. . . in kit form permits damaged parts to be replaced, ending the necessity of replacing the entire unit when damage occurs. Marine plywood crossbars are available in lengths from 2 to 8 ft. Top crossbars have diagonal black stripes against a yellow background.
Pacific Mercury Co, 14052 Burbank Blvd, Van Nuys, Cal.


We're busy as a one-armed paper hanger—making
SUPERIOR EQUIPMENT for the UTILITY INDUSTRY
but we will never compromise with quality
SUPERIOR
SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company
Socket Equipment • Test Switches • Test Blocks • Enclosures

More New Products

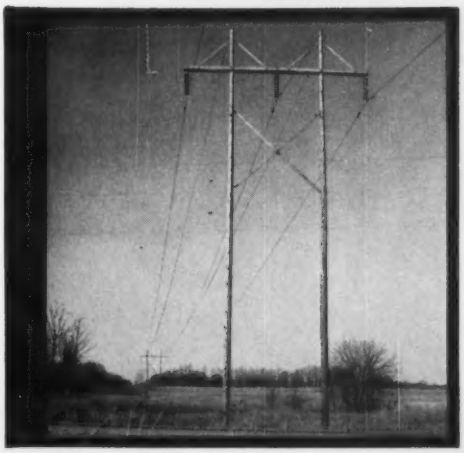
Spatula for cleaning of relay and contact points features diamond particles as the abrasive material. Three models, each designed for specific applications, are available.—Jonard International Corp, Technical Tools Div, 624 Madison Ave, New York, N. Y.

Luminous red **warning flag** provides greater job protection. Made of vinyl-bonded-to-nylon material with dacron stitching, the flag is furnished in three sizes.—Industrial Products Co, 2808 N Fourth St, Philadelphia 33, Pa.

Mercury-vapor **luminaire** has both angular reflector and angular refractor. Variable taps on constant wattage permit primary selections of 100-130/200-260, 240-315, 200-260/400-520 v.—Nepo Mfg Co, Chicago 34, Ill.

Class H **electrical insulations** have thermal stability and lasting dielectric strength. Type 31 and 32 Quinterra are high resin content products.—Johns-Manville Co, 22 E 40th St, New York 16, N. Y.

GALVANIZED STEEL STRAND

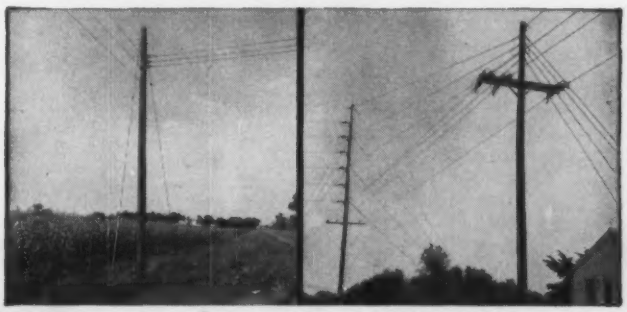


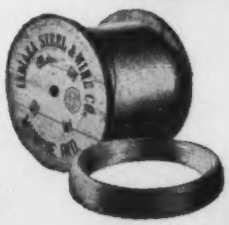
YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand





The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

Readers Service

For additional information on new products, supplies, and services in this issue, the Manufacturers Editor of Electrical World offers his facilities. Check items in which you are interested in list below:

NEW EQUIPMENT

Chance	X-Taps	☐	
GE	Motor	☐	
Motorola	Radiophone	☐	
Pieper-Lillard	Anchor	☐	
Thiel	Bracket	☐	
Falcon	Alarm	☐	
Geigy	Herbicide	☐	
Klein	Plier	☐	
Pacific Mercury	Barricade	☐	

OTHER

Manufacturers Editor
Electrical World
330 W. 42nd St.
New York 36, N.Y.

* Note: Requests must be received within four weeks of publication date, accompanied by complete information specified. This service cannot be offered to readers in foreign countries or to competitive manufacturers.

NAME_____
TITLE_____
DEPT._____
COMPANY_____
ADDRESS_____

FOR:

Reference	☐
Specs	☐
Trial	☐
Purchase	☐

JUNE 15, 1959

Easily changed fuse cap converts cutout interrupting rating from heavy duty to extra-heavy duty

Another Bonus Value from Westinghouse . . .

HEAVY DUTY OR EXTRA-HEAVY DUTY SERVICE WITH A TWIST OF THE WRIST!

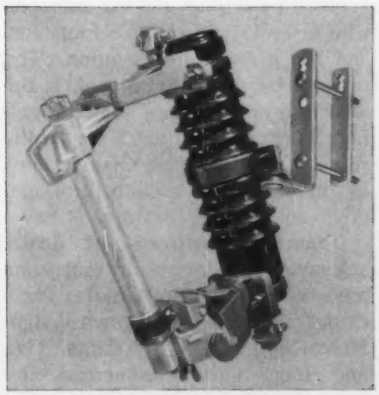
Universal Application—Allows 15% Inventory Reduction

Now . . . *one* Westinghouse cutout for all ratings. Each cutout is shipped with two fuse caps allowing selection of solid cap application for faults up to 5000 amperes and expendable cap for up to full rating of 10,000 amperes. This wide range of application can reduce your inventory requirements by 15% . . . simplify stocking records. And, you get these high current ratings at the *same cost* as the previous 3000-amp I. C. normal duty cutout!

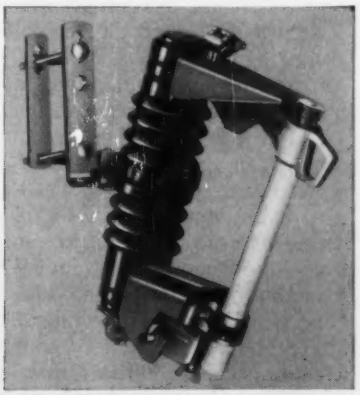
High Power Lab Testing

To insure the complete electrical capability of this new design, Westinghouse carried out controlled current tests to duplicate the toughest duty the unit would ever encounter. Batteries of tests on the new DX and CDX cutouts at the Westinghouse High Power Lab included: temperature rise, radio influence, impulse, wet and dry withstand, vibration and shock tests. The result: A well balanced design with bonus capacity to handle a fault up to 150% of rated NEMA standards! Ask your Westinghouse sales engineer for complete information about the new DX and CDX cutouts and a demonstration right in your own office. Or, for complete information, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

J-60969



CDX CUTOUT features bronze upper and lower current-carrying parts for use in highly corrosive atmospheres . . . especially coastal areas where equipment is subjected to salt spray.



DX CUTOUT, with its steel sleet hood, one-piece porcelain, birdproofing, shockproofing, is especially designed to give years of reliable performance.

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

George Urges Commercial Cooking Program

The creation of a coordinated national leadership program for commercial cooking to provide national industry leadership and stimulate local action by utilities was advocated by E. O. George, vice president of Detroit Edison Co at the recent Edison Electric Institute Commercial Cooking Conference in Chicago. It will give gas competition "a serious battle" for the commercial cooking market, he noted.

George said the EEI Commercial Cooking and Water Heating Committee could provide this leadership. "If we are to make successful inroads on our competition, the EEI committee must adjust its sights and assume the industry leadership necessary to give the electric commercial cooking market strong, bold national representation and aggressive, hard-hitting local action programming," he said.

Five Necessary Ingredients

He listed these necessary ingredients for a national promotion:

1. A central focal point at the national level to become known as the Industry Coordinating Agency.

2. A national advertising and publicity program to provide a common promotional theme which will give national recognition and prestige to the concept of commercial cooking electrically.

3. An individual representative of electric cooking interests qualified and available to call on headquarter offices of national chain food service organizations to sell electric.

4. Distinguished individuals to present the electric commercial cooking story at the National Restaurant Association and the Food Service Equipment meetings.

5. Improved industry communications such as bulletins, newsletters and workshops on a regional basis. Also a training program such as the Housepower Forum or the Academy of Lighting Arts.

"It appears that the electric cooking equipment manufacturers are more concerned with taking business away from each other than in making plans in taking it away from the gas industry. We are simply not creating enough new business through product design and innovation," said A. A. Mesko, of Hotpoint Co's Commercial Equipment Dept.

He also noted: Research costs money, but is an investment in the future—the appliance and apparatus industry is doing 50% of its current business in products not even in existence ten years ago; equipment design should incorporate within itself a functional improvement that returns to its purchaser an upgrading of his operation; and there is a great tendency to copy equipment and therefore very few new ideas exist.

Kitchen Engineering Trends

E. P. Steinberg, Alex Janows Co, Chicago, Ill., discussed trends in kitchen engineering. "For the first time in history, the food service industry has accepted the kitchen designer, consultant, or engineer as a basic part of its structure," he said.

The industry is looking for expert advice now when a few years ago they ignored it, he noted. This is because the restaurant business today is such an expensive undertaking that if the owner wants to make a profit he has to call on someone who knows ways to save footsteps, and run a one-man operation. The other reason, Steinberg said, is the idea is now promoted that the restaurant man should pay a fee for the services of a kitchen engineer just as one does for architectural and other engineering services.

Teamwork between the dealer salesman and the utility salesman pays off according to Charles Pace, dealer salesman for Brown-Wright Hotel Supply Corp, Atlanta, Ga., and Henry Smith, commercial sales engineer, Georgia Power Co.

How is it accomplished? Pace said that when he arrives in a town he contacts the commercial sales engineer of the power company. If the engineer has any prospects they call on him together. If Pace needs help in another case in getting a customer to go all electric, he and the sales engineer discuss the customer's objections before they make the call. These methods have proved out, according to Pace. In 3½ years of selling commercial cooking he has never sold a gas installation.

Smith told how the dealer salesman and the utility salesman should team up.

1. The dealer salesman should contact the utility salesman to find out the service voltage and phase.

2. Electrical load data should be forwarded to the engineering department.

3. The dealer salesman should contact the utility man upon the sale of any equipment so that the latter can advise the customer of the best rate.

4. The utility salesman should explain the company's service policy to the customer.

Wisconsin Electric Power Contest Deemed a Success

A Live Better Electrically contest which attracted less entries than some other contests conducted by the company was nevertheless deemed "very successful," by Wisconsin Electric Power Co.

This was because each entrant was required to read a considerable amount of copy about electric living and Housepower, answer 15 questions about all-electric living, and write a 25-word statement on why he wanted to live the all-electric way. Contestants were also required to suggest 15 electric appliances considered most important in an all-electric kitchen and 5 electric appliances most important for an all-electric laundry.

An additional feature of the contest was a Contest Credit Certificate which was mailed to every person who sent in an eligible entry. When presented to any electric appliance dealer, the Certificate provided a discount of from $2 to $15 on the purchase of any one of a specified list of appliances.

Three first prizes were appliances valued up to $500.

*TRADE MARK "GUY-GRIP"

THE MODERN TWIST IN GUYING... APPLIES TO ALL MATERIALS

SEND FOR: "THE GOOD GUY," APPLICATION PROCEDURE, AND PRICE SHEET

PREFORMED LINE PRODUCTS CO.
DEPT. GG 1A
5349 St. Clair Avenue
Cleveland 3, Ohio

PATENTED — U.S. PATENT NUMBER 2,761,273

ROYAL PRECISION

LGP-30

Electronic digital computer permits load-flow calculations on networks of up to 100 busses and 270 lines at lowest cost

Gives you optimum level efficiency in production, sales, purchase!

The lowest-priced complete computer you can buy, the versatile LGP-30 saves you time and money by 1) economically solving your load-flow problems; 2) forecasting optimum turbine-generator and boiler usage under varying conditions of system demand; 3) optimizing purchase and sales of power.

Now at work serving numerous electrical utilities, the compact, mobile LGP-30 operates from any convenient wall outlet . . . requires no expensive air-conditioning or installation. It gives you twice the capacity of any computer in its class, yet is by far the easiest to program in basic machine language.

Internal components of the LGP-30 have been greatly reduced to insure highest reliability. Operation has been remarkably simplified. Your personnel are quickly trained by Royal McBee without charge. Sub-routines and programs are available – as well as membership in an active users organization. Sales and service facilities are maintained coast-to-coast. For further information and specifications, write Royal McBee Corporation, Data Processing Division, Port Chester, N.Y. In Canada: The McBee Company, Ltd., 179 Bartley Drive, Toronto 16.

ROYAL McBEE · *data processing division*

ANDRUS

DINWIDDIE

NAIRNE

HOOTS

New Orleans PS Names Andrus President

Gerald L. Andrus has been elected president of New Orleans Public Service Co, succeeding George S. Dinwiddie who was made chairman of the board. Clayton L. Nairne was elected executive vice president, and Paul F. Hoots a vice president.

Andrus, who was formerly vice president, joined Public Service in 1928. He then served in the accounting and insurance departments until 1934. In that year he became assistant secretary and assistant treasurer, and in 1945 was named assistant to vice president. He was elected comptroller in 1947 and vice president in 1952.

Dinwiddie was first employed by Public Service in 1936 as tax and research clerk. He was elected president in 1951.

Nairne first worked for the utility in 1924 and 1925 as a student engineer. He rejoined the company in 1928 as a draftsman and combustion engineer in the gas department. He was made vice president in 1953.

Hoots was assistant to the president before his election as vice president. He joined Public Service in 1919 as a chemist. He became assistant chief engineer in the power department in 1925, research engineer in 1929, and chief engineer in 1934. He was appointed assistant to the president in 1939.

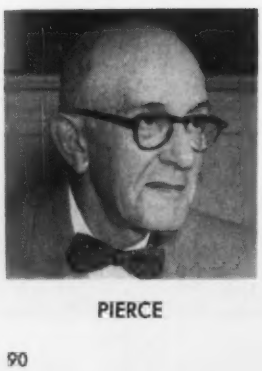
Crawford Made VP of Middle South

W. Donham Crawford has been named vice president of Middle South Utilities Co.

He joined Middle South in 1955 and has served as assistant secretary and assistant treasurer since June, 1956.

Prior to joining Middle South, he spent four years with the Savannah River Operations Office of the Atomic Energy Commission, and before that was chief, office science and technology of the Pan American Union.

He is a graduate of the United States Naval Academy and has an M.S. from California Institute of Technology. After graduating from Annapolis he served with the Navy as an officer with the Atlantic Fleet.

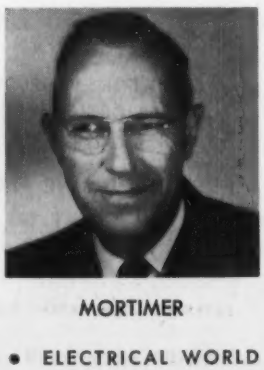

PIERCE

Pierce, Mortimer New VPs

W. C. Pierce and E. S. Mortimer have been made vice presidents of Eastern Shore Public Service Co.

Pierce has been general sales manager of the utility since 1954. He joined Eastern Shore Public Service in 1926 as industrial engineer. He was named industrial sales manager in 1944.

Mortimer has been manager of operations since 1953. Other posts included assistant superintendent of construction, and superintendent of operations.


MORTIMER

RAWLS

TURNER

RODRIGUE

Lousiana Power & Light Promotes Top Executives

G. C. Rawls has been named president of Louisiana Power & Light Co. W. O. Turner was made chairman of the board, and E. A. Rodrigue was elected a vice president. John H. Erwin, Jr. was made assistant secretary and assistant treasurer.

Rawls was formerly vice president in charge of operations. He joined LP&L in 1939 in that post. Before that he was with Mississippi Power & Light Co from 1926 as laborer and division manager.

Turner joined LP&L in 1928 and was made president and general manager in 1939.

Rodrigue joined the company in 1933 as an assistant switchboard operator at the Sterlington steam-electric generation station. He later served as sales representative, industrial engineer, and division sales manager. In 1946, he was named residential and rural sales manager, and in 1953 was promoted to manager of the Southeastern Division.

PERSONAL BRIEFS

Potomac Electric Power Co has named **Mary L. Quinn,** director, home service division; **G. P. Snyder,** senior engineering draftsman, station engineering division; and **George B. Schmith,** field supervisor, distribution engineering division.

Roy F. Christianson, has been promoted to assistant advertising manager of Wisconsin Electric Power Co.

V. S. Casebolt has been promoted to manager of Washington Water Power Co's personnel and industrial relations department.

W. Herman Saxton, manager of the Tallahatchie Valley Electric Power Assn, Batesville, Miss., has been elected president of the Tennessee Valley Public Power Assn.

William L. Fraser has been appointed director of the St. Lawrence Power Project for The Hydro-Electric Power Commission of Ontario.

J. E. Anderson has been named treasurer, and John H. King, controller, of Puget Sound Power & Light Co.

Robert A. Monroe, chief design engineer of the Tennessee Valley Authority retired May 31 after more than 22 years of service.

Glenn W. Fulmer has been named manager, service engineering for the controls division of Hagan Chemical & Controls, Inc.

Glenn C. Earl has joined the electrical equipment department of Mullenbach division, Electric Machinery Manufacturing Co, as staff assistant to the general manager, in charge of marketing.

Titus LeClair, manager of research and development at Commonwealth Edison Co, has been elected board chairman of Internuclear Co. He will continue in his Commonwealth Edison post.

Irving Koss has been named manager of the Microwave Department and Industrial Control Products Department of Motorola Inc's communications and industrial electronics division.

Melvin D. Henry has joined Anderson Electric Corp as sales application engineer, distribution division.

(More News About People on p 92)

CONBOY

CRANE

Penn-Union Appoints Two New VPs

Penn-Union Electric Corp has named Fred T. Conboy vice president and assistant to the president. Lester R. Crane has been appointed vice president-sales.

Conboy has been with the company for 24 years. Crane joined the company in 1958 as sales manager. Before that he was distribution sales manager of Anderson Electric Co.

Ralph J. Foster, controller, has been promoted to treasurer.

Rennix Named General Sales Manager

Victor E. Rennix, general sales manager of Electro-Motive Division of General Motors, has been named to succeed Paul R. Turner, retired director of sales. His position of general sales manager will include all the responsibilities heretofore assigned to the director of sales.

Rennix was with the Baldwin Locomotive Works from 1919 until 1944. He then joined Electro-Motive as a sales engineer in the Chicago office. He was appointed regional manager in 1946, and general sales manager in 1953.

Clark Elects Rosecky Executive Vice President

Joseph J. Rosecky has been named executive vice president of Clark Bros. Co.

Rosecky joined Allis Chalmers Mfg Co in 1924, rising to general works manager. In 1950, he joined Dresser Industries, serving first as a staff member at Clark Bros., and later as general manager of the Torrance, Calif. plant of Ideco Co, another Dresser division.

From 1952 to 1957, he served with the Baldwin-Lima-Hamilton Corp. He joined Clark that year as vice president-operations.

RMEL Meets . . .

(*Continued from page* 45)

improved insulation and moisture exclusion, and fewer emergencies due to higher apparatus reliability and better line protection, he said.

Moreover, average emergency duration is being reduced by increasing dependence upon highway-type mobile substations or mobile transformers. Mobile transformer rating need not equal that of the transformer it replaces, Smith said, as its main purpose is to reduce load on the remaining units from an emergency 24-hr value to normal.

Adoption of distribution transformers without taps has been made standard by Public Service Co of Colorado, said R. L. Wardlow. The cost-saving step was permitted by judicious application of switched and unswitched primary capacitors for voltage control. Excellent capacitor performance with voltage-sensitive control has justified the change. Experience indicates that capacitor banks may be installed on laterals protected by single-phase sectionalizing devices, he concluded.

Preliminary but comprehensive study has shown Public Service of Colorado that a "no-secondary" distribution system has economic, reliability, and appearance advantages over cabled and open-wire secondary constructions. The utility is comparing all three types by actual installation in a typical subdivision, reported R. L. Tilson.

Summation of present-worth values over 10 years showed that the no-secondary system, dropping as many as eight services from each transformer pole, was only 78% of the cost of open-wire installation. Cabled secondaries showed a small advantage over open-wire.

Cost of residential underground systems may be reduced by eliminating the concrete cable envelope, said H. M. Woehler, Department of Public Utilities, Colorado Springs, Colo. An early installation for 38 lots was supplied with neoprene-sheathed conductor in fibre conduit, encased in concrete envelope laid 30-in. below the surface. Credit was given the customer on the cost of the entire overhead system, but the utility installed the primary system only, the meter being at the transformer. Additional cost per lot was only $251 for this tract layout.

—PROFESSIONAL SERVICES—

BLACK & VEATCH
Consulting Engineers
Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates
1500 Meadow Lake Parkway
Kansas City 14, Missouri

THEODORE D. BROSS
LINE CONSTRUCTION CORP.
Steel Tower & Wood
Transmission Lines
Distribution & Maintenance
175 Enfield St. Hartford, Conn.

COMMONWEALTH
SERVICES INC. | **ASSOCIATES INC.**
Management and Business Consultants
200 Park Ave
New York 23, N. Y.
Consulting and Design Engineers
200 E. Washington
Jackson, Michigan

ELECTRICAL TESTING
LABORATORIES, INC.
Electrical, Electronic, Environmental, Photometric and Chemical Laboratories. Testing, Research, Inspection and Certification.
2 East End Ave. New York 21, N. Y.

HOOSIER ENGINEERING
COMPANY
Erection and Maintenance of
Electrical Transmission and Distribution Lines
1350 Holly Ave., Columbus 16, Ohio

JENSEN, BOWEN & FARRELL
Engineers
Appraisals—Depreciation Studies—Property Records
Cost Trends—Special Studies—Reports
for Rate Cases, Security Issues, Regulatory and Accounting Requirements
Michigan Theatre Building Ann Arbor, Michigan
NOrmandy 8-7778

PIONEER SERVICE &
ENGINEERING CO.
Consulting and Design Engineers . . Purchasing Specialists in Financing Accounting and other Operations
231 So. La Salle St. Chicago 4

SANBORN MAP COMPANY
Nation Wide Mapping Services
• Utility Area Base Maps
• Symbolized System Portrayal
Atlanta - New York - Chicago - San Francisco

SARGENT & LUNDY
Engineers
140 South Dearborn St.
Chicago, Ill.

TIPPETT & GEE
Consulting Engineers
Mechanical • Electrical • Thermodynamic
Structural Design • Studies • Supervision
Power Stations • Transmission • Distribution
Industrial Plants • Process
1333 North Second Street Abilene, Texas

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

DISPLAYED RATE: ——RATES—— **UNDISPLAYED RATE:**

EMPLOYMENT OPPORTUNITIES: $22.87 per inch. Subject to Agency Commission.
EQUIPMENT & BUSINESS OPPORTUNITIES: $16.88 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission. ON ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

$1.80 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.80 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of Electrical World, P. O. Box 12, N. Y. 36, N. Y.

POSITION WANTED

Propect Manager or Superintendent. Electrical construction experience in generating stations, industrial plants, substations, transmission lines and distribution systems. Will relocate. PW-1902, Electrical World.

SELLING OPPORTUNITIES OFFERED

Representative wanted for manufacturer of street lighting equipment, pole line specialties. Full particularies, RW-9821, Electrical World.

Leading British manufacturer of transformers and rectifiers requires representatives all areas U.S.A. Established sales connection essential. Write initially RW-1805, Electrical World, to arrange meeting with visiting executive.

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-5208) will be received at Denver, Colorado, until 2 p.m., Mountain Standard Time, July 21, 1959, for furnishing twelve 230-kv, 1,600-ampere, 10,000,000-kva and two 69-kv, 1,200-ampere, 1,000,000-kva power circuit breakers for Fort Thompson Substation, Transmission Division, South Dakota, Missouri River Basin Project. Delivery is desired within 510 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 25, Colorado. Floyd E. Dominy, Commissioner.

TRANSFORMERS
1—6000 kva, GE, 3/66000/2400/4160Y
1—2000 kva. Nia. Askarel, 3/13800/4160Y/2400
3—1000 kva, West. 1/13800/480
1—1000 kva, Standard, 3/44000/6600
1—1000 kva, Standard, 3/34400/2400/12000
1—1000 kva, Standard, 3/22900/2400/4160Y
1—1000 kva, Standard, 3/13800/2400/4160Y
ERIE ELECTRIC CO, INC.
26 Mechanic St., Buffalo 2, N. Y.

At Your
BUSINESS Service

The Classified Advertising Sections (Searchlight Sections) of McGraw-Hill publications are at your service for the satisfying of almost every business need or want.

Because these publications are specialized in the field that they cover, your classified advertising of used or surplus new equipment, of securing a position of personnel, of offering or securing business opportunities will reach the right men, quickly and economically.

Classified Advertising Division
McGraw-Hill Publications, Inc.
P. O. Box 12, New York 36, N. Y.

ENGINEERS

Est., growing company in heavy duty control field
Openings available for:
DEVELOPMENT ENGINEERS (Electrical & Mechanical)
CONTROL SYSTEM ENGINEERS (Electrical)
CONTROL ENGINEER (Electrical)
MANUFACTURING (Industrial Engineer)
1 to 7 years experience. Liberal fringe benefits program. Salary commensurate with experience.
Contact: **Personnel Department**
SQUARE D COMPANY
EC&M Division
4500 Lee Road—Cleveland 28, Ohio
LUdlow 1-1800

Graduate EE or ME, age 35-50 preferred, for engineering firm in Philadelphia. Requires extensive consulting or utility experience on property evaluations, cost of service determinations, rate case and operation studies. Experience in dealing with State regulatory bodies desirable. Must be competent to write reports effectively. Some travel involved.
Send confidential resume and salary requirements to:
P-1818, Electrical World
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

MOTORS • GENERATORS
TRANSFORMERS
NEW • REBUILT
ELECTRIC EQUIPMENT CO.
WORLD'S LARGEST INVENTORY
CALL COLLECT GL 3-6783
P O BOX 51 • ROCHESTER 1, N Y

LARGE POWER EQUIPMENT
Prompt Stock Shipment
RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?
BELYEA COMPANY, INC.
51 Howell St. Jersey City, N. J.
OL-3-3334

ADDRESS BOX NO. REPLIES TO: Box No. Classified Adv. Div. of this publication. Send to office nearest you.
NEW YORK 36: P. O. BOX 12
CHICAGO 11: 520 N. Michigan Ave.
SAN FRANCISCO 4: 68 Post St.

POSITIONS VACANT

Relay And Meter Test Engineer. Graduate EE with minimum 6 years experience meter and relay testing and relay coordination with operating utility. Must calculate system short-circuit conditions, prepare relay coordination curves, test and adjust relays, test and adjust watthour meters and perform general system testing and trouble shooting for small but fast-growing utility in Middle East. Ability organize test section, formulate test procedures, train test personnel and specify operating and test equipment is essential. Carrier system and two-way radio experience desirable but not essential. Salary $16,000 to $17,000 with two-year contract and other benefits. P-1838, Electrical World.

Transformer Designing Engineer, who is capable of designing oil cooled, electrical power transformers, up to 1000 KVA. Location New Jersey. New company going into business. P-1880, Electrical World.

Readers Forum

Comments on Co-op Article

To the Editor:

Your management newsletter in your May 18th issue concerning the rural electric cooperatives was most interesting, but some of the facts were not correct.

In the third paragraph you say, "The use of taxpayers' money to subsidize the REA co-ops was justified in the early days by need." We take issue of the word subsidize since in the early days our interest rate was based on the cost of money to the Government and notes were signed whereby the co-ops agreed to pay back the principal amount of these notes within twenty years. As you may or may not know, the Pace Act later changed the interest rate and the amortization period. But, in spite of this, I contend the word subsidize should not be used in connection with the rural electric co-ops. If the taxpayers' money is being used to make loans to the rural electric co-ops, then it can not be a subsidy for the taxes we pay cost the Government nothing.

In the last paragraph of your article, you mention the fact that it might be all right for the rural electric co-ops to keep a little of their excess funds as a small cushion for operating contingencies. We are a small rural electric co-op with a total plant value of about $1,600,000. Would you be so kind as to suggest to me a dollar amount that you think we should keep as a small cushion for operating contingencies in our operation.

Everett S. Hoy
Manager

Butler Rural Electric
Cooperative, Inc.
Hamilton, Ohio

Multipurpose Yard Light

To the Editor:

Here's a contribution for your Electrical Dreamers Club!

The electric industry has been looking for an "artificial gas light" to offset the popular unit promoted by the gas industry. Photoelectric cells and outlets have been added to the electric post lantern to increase customer appeal. Why not also make it an electrical bug killer? This can be easily done by the addition of a high voltage transformer similar to a small neon sign transformer and the necessary wire grid as is being used on the many electrical bug killers on the market.

As you know, the grub worm is a pest to lawns, gardens and flowers. The grub worm in one stage of life is the well known June bug, which is attracted to light and would be easily exterminated. The webb worm in one stage of life is a small white moth that is also attracted to light. Therefore, the webb worm could also be eliminated. By also incorporating an appropriate scent, flies could also be attracted and thus eliminated.

Such a post lantern that not only provides a photo-electric cell, an electric outlet for garden tools, electric lawnmowers, etc. but also will exterminate undesirable pests and flies, at a price of a few dollars more than the gas light, should certainly have considerably more customer appeal than the gas light.

R. L. Dunten
Commercial Manager
Central Power and Light Company
120 N. Chaparral Street
Corpus Christi, Texas

What Made Pat Look?

To the Editor:

Why did Bayard (Pat) England move his head in reproduction of cover picture (EW5-18-59) on page 3?

A. M. Casto
Jersey Central Power & Light Co
20 South Street
Morristown, N. J.

He just couldn't keep his eyes off that electric car.

Advertising Index

Allis-Chalmers Mfg. Co.....33, 35
American Chain & Cable Co., Inc.
Wright Hoist Div..... 70
Chance Co., A. B. 71
Chase Brass & Copper Co..... 30
Chevrolet Div.
General Motors 28
Continental-Diamond Fibre,
Sub Budd Co. 32
Continental Wire Corp..... 73
Cornell-Dubilier Electric Corp..... 11

Directory of Engineers..... 93

Engineers, Directory of..... 93

General Electric Co.
Apparatus Dept. .....2nd Cover, 9, 55, 56, 57, 58
Gould-National Batteries, Inc..... 69
Graybar Electric Co., Inc..... 7
Gulf Oil Corp.....80, 81

Hi-Voltage Equipment Co..... 29
Hubbard & Company.....60, 61

Indiana Steel & Wire Co., Inc..... 85
Island Creek Coal Sales Co..... 79

Johns-Manville 8, 34

KPF Electric Co.....16, 17
Kellogg Switchboard & Supply Co.... 18

Lapp Insulator Co., Inc..... 36
Leeds & Northrup Co..... 10
Line Material Industries.....23, 24, 25, 26, 27

McCabe-Powers Body Co..... 4
Moloney Electric Co..... 38

National Electric Coil
Div. McGraw-Edison Co..... 82

Okonite Co. 70

Pennsylvania Transformer Div.,
McGraw-Edison Co. 66, 67
Pfaff & Kendall 68
Phelps Dodge Copper Products Corp.. 6
Preformed Line Products Co..... 89

RT&E Corp. 31
Read Standard Div.
Capitol Products Corp..... 37
Royal McBee Corp..... 89

S&C Electric Co.....12, 13
Sangamo Electric Co..... 63
Searchlight Section 93
Simplex Wire & Cable Co.....3rd Cover
Superior Switchboard & Devices Co.. 84

Utility Tool & Body Co..... 70

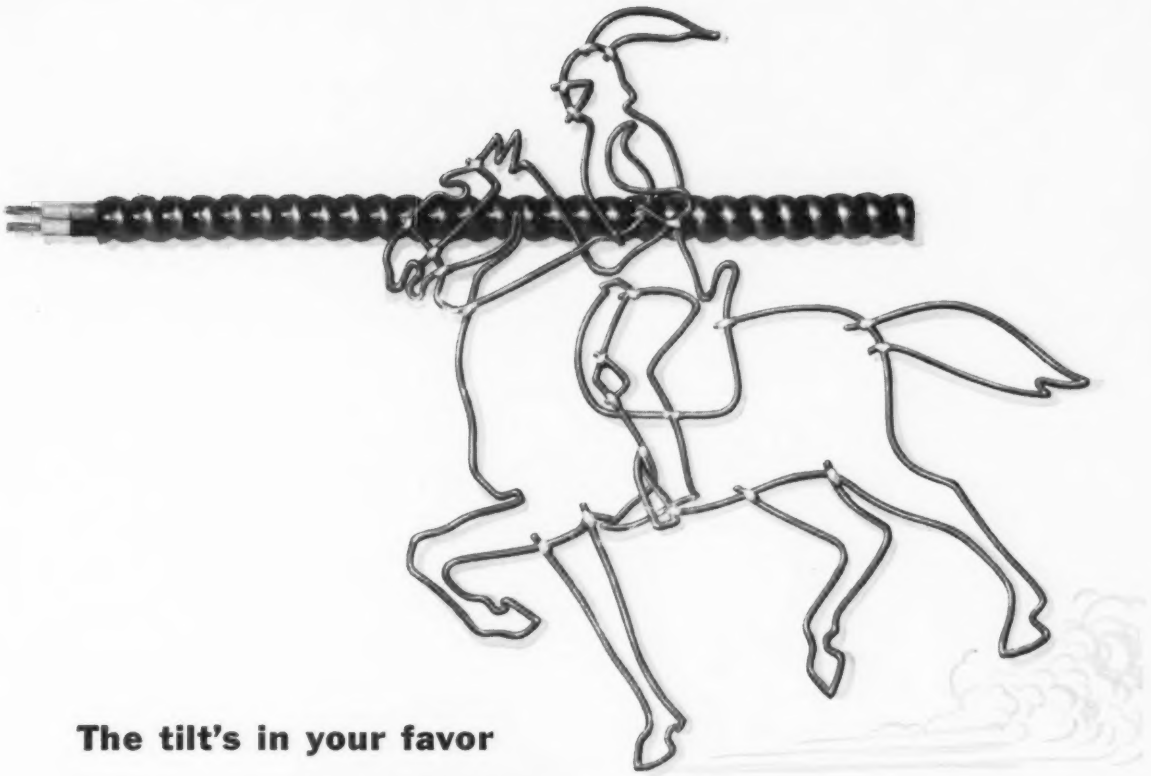
Westinghouse Electric Corp..14, 15, 74, 86, 87
Western Red & Northern White Cedar
Assoc. 65
Worthington Corporation .....4th Cover
Wright Hoist Div.,
American Chain & Cable Co., Inc.. 70

PROFESSIONAL SERVICES 93

CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES 93

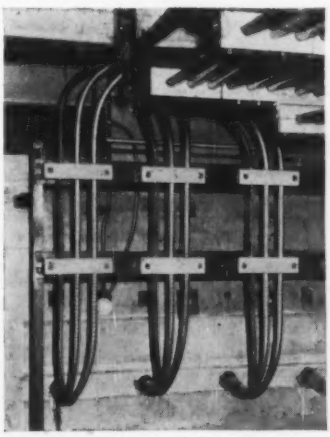
EQUIPMENT
(Used or Surplus New)
For Sale 93



The tilt's in your favor

when you use CONDEX

the new color coded armor



New, color-coded Simplex aluminum CONDEX interlocked armored cables permit maximum efficiency and flexibility in plant layout planning, and they make installation and maintenance easy.

Simplex CONDEX, with armor of galvanized steel, aluminum, bronze, or stainless steel, can be applied over cable cores of up to 4" or more in diameter.

In many thousands of installations, Simplex CONDEX has proved its flexibility, and its great resistance to crushing and mechanical damage. Operates efficiently even in extremes of climate and temperature. Write for detailed specifications folder.

Simplex

LIVE BETTER ELECTRICALLY

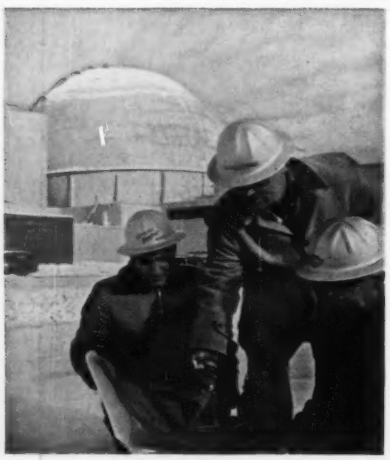
WIRE & CABLE COMPANY

79 Sidney Street, Cambridge 39, Mass.

INNOVATIONS IN FLUID HANDLING: #1 OF A SERIES
STEAM GENERATING GROUP
ELECTRIC GENERATING GROUP
As the manufacturer of all major components of the fluid handling group (pumps, condensers, deaerators, ejectors) Worthington has a reservoir of experience and knowledge that can benefit you.

NUCLEAR CONDENSER

Dresden unit is tailored to special needs of nuclear plants



Engineers of General Electric, Worthington and Bechtel Corporations worked together closely with Commonwealth Edison on new Dresden Station.

Four major problems faced Worthington in the design of a 120,000 sq. ft. condenser for the Dresden Nuclear Power Station being built by General Electric Co. for Commonwealth Edison Co. and the Nuclear Power Group, Inc. They were: (1) necessity of handling full output of dump steam, (2) quantities of free gases in the steam, (3) maintaining condensate purity, and (4) providing radioactive decay time for the condensate.

Worthington engineers, working in close cooperation with the customer, his design engineers and contractors, solved these problems. To handle dump steam, pressure breakdown devices were installed in the condenser itself and in a special "blister" on one side of the condenser. An extra large ejector was used to handle quantities of free gases. And to maintain condensate purity double tube sheets were used and special deaeration features were provided.

Radioactive decay time was provided by means of the special hotwell which is baffled to make the transit time of the condensate long enough to allow short-lived radioactive impurities to decay to lower levels.

This typical example shows you how Worthington applies its experience as a manufacturer of all major components of the fluid handling group in solving the problems of one particular element. To put this progressive "know how" to work on your power plant problems, conventional or nuclear, contact your nearest Worthington district office. Or write to Worthington Corporation, Section 45-8, Harrison, N. J. In Canada: Worthington (Canada) Ltd., Brantford, Ontario.

WORTHINGTON

R

nts

baf-
ien-
dio-
els.
now
s a
s of
the
put
on
onal
ing-
gton
N. J.
Ltd.,